

Consultancy Services for Carrying out Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services in respect of 2 laning with paved shoulder of *Imphal-Jiribam section of NH-37 (NH-53) (length- 220 Km)* in the State of Manipur (PKG NO. NHIDCL/DPR/CT-IJ-TP/Manipur/2017)

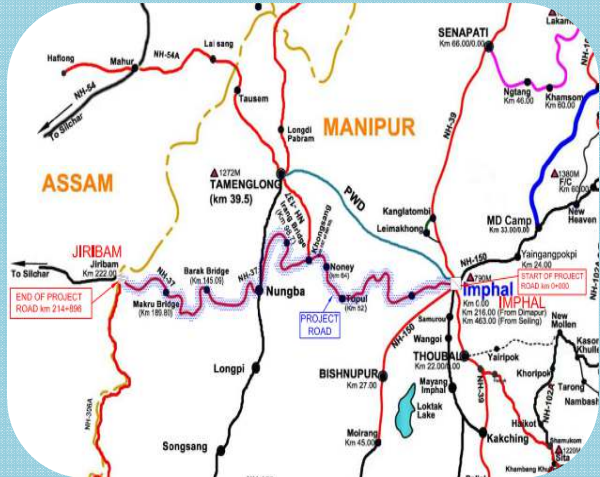
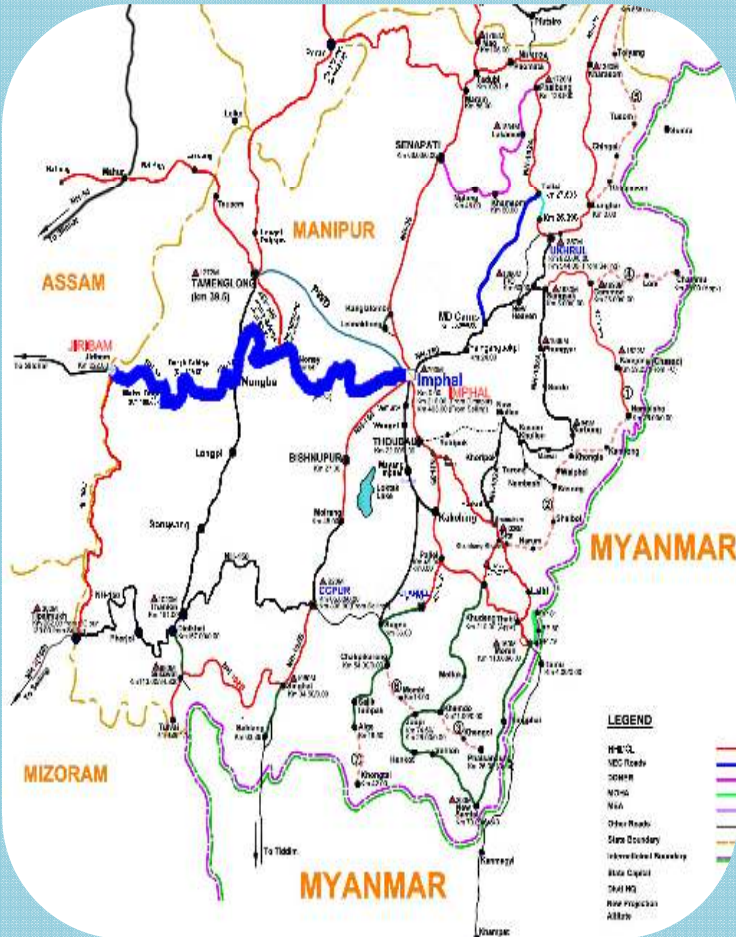
PACKAGE – I
DESIGN CH:
15+940 KM TO
33+120 KM

DRAFT DETAILED PROJECT REPORT
VOLUME – V: TECHNICAL SPECIFICATION
VOLUME – VI: RATE ANALYSIS
VOLUME – VII: COST ESTIMATE
VOLUME – VIII: BILL OF QUANTITY



National Highways & Infrastructure Development Corporation Ltd.

PTI Building, 3rd Floor, 4, Parliament Street, New Delhi-110001



C. E. Testing Company Pvt. Ltd.
124-A, NSC Bose Road, Kolkata -92

Road name- IMPHAL-JIRIBAM ROAD SECTION OF NH-53 (OLD NH-37)
PKG-II
(FROM DESIGN CH KM 15+940 TO KM 33+120)
GENERAL ABSTRACT OF COST

Length of Road (KM) : 17.180

DESCRIPTION OF WORKS		TOTAL COST (IN Cr.)	COST PER KM. OF TOTAL ROAD LENGTH (IN Cr.)	% of Cost of Civil Works (% of C)
A.	ROAD WORKS			
1	Site Clearance and Dismantling	1.91	0.11	1.34%
2	Earth work ,Subgrade and Erosion control	10.93	0.64	7.69%
3	Sub-Base & Base	34.81	2.03	24.51%
4	Bituminous Courses	29.78	1.73	20.96%
5	Junction Improvement	0.29	0.02	0.20%
6	Traffic signs, Road marking & other road appurtenances	3.32	0.19	2.34%
7	Passenger Shelter	0.12	0.01	0.08%
8	Busbay	0.89	0.05	0.63%
	Drainage and Protective Works			
9	Longitudinal Drains	11.38	0.66	8.01%
10	Retaining wall	2.96	0.17	2.08%
11	Breast wall	12.86	0.75	9.05%
B.	BRIDGES & CULVERTS			
12	Culvert	23.46	1.37	16.52%
13	Minor Bridge	5.20	0.30	3.66%
C.	COST OF CIVIL WORKS IN LAKHS (AS PER SOR 2018)	137.91	8.03	
D.	Escalation @ 3% WPI	4.14		
E.	Total Civil Cost including Escalation@3%	142.05	8.27	
F.	Maintenance for 5 years, i.e 2.5% on civil cost (E)	3.55		
G.	GST @ 12% of (E)	17.05		
H.	Contingencies @ 2.8% over Civil Cost (E)	3.98		
I.	Supervision Charges @ 3% of (E)	4.26		
J.	Agency Charges @3% of (E)	4.26		
K	Escalation Cost @ 2.5% during Construction Period(For 1.5 Yrs of construction period, No escalation in 1st Year and 2.5% for 0.5 Years)	3.55		
L.	TOTAL CONSTRUCTION COST (C+D+E+F+G+H+I)=J	178.70	10.40	
M.	DEPARTMENTAL COST			
a.	LA Cost	11.31		
b.	Encroachment Demolition Cost	2.84		
c.	Utility Shifting(Electrical+PHE)	2.13		
d.	Environmental Budget	3.00		
N	Sub Total (L)	19.28		
O	TOTAL PROJECT COST (N+M)=O	197.98	11.52	



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VOLUME - V
TECHNICAL SPECIFICATION



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Technical Specification

1.1 General

The Technical specifications covering the materials and the workmanship aspects as well as method of measurements and payments are included in this section. These specifications cover the items of civil and non-civil works coming under scope of this document. All work shall be carried out in conformity with the same. The works shall be executed in accordance with good practices followed for achieving high standards of workmanship, thus ensuring safety and durability of the construction. All codes and standards referred to in these specifications shall be the latest thereof unless otherwise stated.

1.1.1. Inclusive Documents

The provisions of special conditions of contract, those specified elsewhere in the tender document, as well as execution drawings and notes, or other specifications issued in writing by the Engineer shall form part of the technical specifications of this project.

The attention of the contractor is drawn to those clauses of codes which require supporting specification either by the Engineer or by 'Mutual agreement between the supplier and purchaser'. In such cases, it is the responsibility of the tenderer /contractor to seek clarification on any uncertainty and obtain prior approval of the Engineer before taking up the supply/construction. In absence of such prior clarification, the Engineer's choice/design will be final and binding on the contractor without involving separately any additional payment.

1.1.2. Defective Works

All defective works are liable to be demolished, rebuilt and defective materials replaced by the contractor at his own cost. In the event of such works being accepted by carrying out repairs etc. as specified by the Engineer the cost of repairs will be borne by the contractor.

1.2 Site Information

The information given hereunder and provided elsewhere in these documents is given in good faith by the Employer but the Contractor shall satisfy himself regarding all aspects of site conditions and no claim will be entertained on the plea that the information supplied by the Employer is erroneous or insufficient.

1.2.1 Location

The area in which the works are located is in Plain and Mountainous terrain.

Package -IA (Km 0+000 to Km 13+747) of Churachandpur - Tuivai (NH-102B) road is situated in the district of Churachandpur, Manipur.

1.2.2 General Climatic Conditions

Churachandpur District is one of the 16 districts of Manipur state in north-eastern India. The district is bounded by Senapati district in the north, Bishnupur and Chandel districts in the east, Assam and Mizoram in the west and Myanmar on the south. The total population of the district as per 2011 census is 2,71,274. This district with its headquarters at Churachandpur has been divided into five blocks, i.e. Churachandpur, Thanlon, Henglep, Singhat and Parbung.

1.2.3 Seismic Zone

The works are located in Seismic Zone V as defined in IRC: 6-2000.

2. GENERAL REQUIREMENTS

The Technical Specifications in accordance with which the entire work described hereinafter shall be constructed and completed by the Contractor shall comprise of the following:

2.1 PART-I: General Technical Specifications

The General Technical Specifications shall be the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (FIFTH REVISION, April 2013)", issued by the Ministry of Road Transport & Highways, Government of India and published by the Indian Roads Congress (IRC), with a cross reference to relevant Bureau of Indian Standards (BIS) for materials or other aspects not covered by the IRC.

2.2 PART-II: Supplementary Technical Specifications

The Supplementary Technical Specifications shall comprise of various Amendments/ Modifications/ Additions to the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" referred to in PART - I above and Additional Specifications for particular item of works not already covered in PART-I.

- 2.2.1. A particular clause or a part thereof in "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (FIFTH REVISION, April 2013)" as corrected in the original referred in PART-I above, where Amended/ Modified/Added upon, and incorporated in PART-II, referred to above, such Amendment/Modification /Addition supersedes the relevant Clause or part of the Clause.
- 2.2.2. When an Amended/Modified/Added Clause supersedes a Clause or part thereof in the said Specifications, then any reference to the superseded Clause shall be deemed to refer to the Amended/Modified/Added Clause or part thereof.
- 2.2.3. In so far as Amended/Modified/Added Clause may come in conflict or be inconsistent with any of the provisions of the said Specifications under reference, the Amended/Modified/ Added Clause shall always prevail.
- 2.2.4. The following Clauses in the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (FIFTH REVISION, April 2013) have been Amended/ Modified/ Added upon;

Sr. No.	Section No.	Section Title	Clause No.
1.	100	General	100,105,106,107,108,109,110,111, 112,114 and 120
2.	200	Site Clearance	200,201 and 202
3.	300	Earthwork, Erosion Control and Drainage	300,301,304,305,307 and 309
4.	400	Sub-base, Bases (Non-Bituminous) and Shoulder	400,401,404 and 406
5.	500	Bases and Surface Courses	500, 501, 502, 503, 505, 507, 509



Sr. No.	Section No.	Section Title	Clause No.
		(Bituminons)	and 516
6.	800	Traffic signs, Markings and other Road Appurtenances	801, 802, 803, 804, 805, 807 and 811
7.	900	Quality Control for Road works	901 and 903
8.	1000	Materials for Structures	1007, 1008, 1010, 1012, 1014 and 1015
9.	1500	Form Work	1501,1502,1503,1504,1506, 1507 1508,1509, 1510 and 1513
10.	1600	Steel Reinforcement (Untensioned)	1602,1604,1605, and 1606
11.	1700	Structural Concrete	1705, 1707, 1711, 1716 and 1718
12.	2100	Open Foundations	2106
13.	2200	Substructures	2204 and 2210
14.	2500	River Training Work and Protection Work	2504, 2507 and 2509
15.	2600	Expansion Joints	2602, 2607, 2608, 2609, 2013, 2014, and 2615
16.	2700	Wearing Coat and Appurtenances	2702, 2703, 2704, 2705, 2706, 2708 and 2709

In the absence of any definite provisions on any particular issue in the aforesaid Specifications, reference may be made to the latest codes and specifications of IRC, BIS, BS, ASTM, AASHTO and CAN/CSA in that order. Where even these are silent, the construction and completion of the works shall conform to sound engineering practice as approved by the Engineer.

2.3 The latest edition till 28 days before the final date of submission of the bid of all specifications / standard shall be applicable.

PART II

SUPPLEMENTARY TECHNICAL SPECIFICATION

AMENDMENTS/MODIFICATIONS/ADDITIONS TO EXISTING CLAUSES OF GENERAL TECHNICAL SPECIFICATIONS

SECTION 100 GENERAL

CLAUSE 102 DEFINITIONS

The following abbreviations shall be added in this Clause:

"MORT&H"	:	Ministry of Road Transport & Highways (Previously known as 'MOST', Ministry of Surface Transport)
"NHIDCL"	:	National Highway Infrastructure Development Corporation Limited.
"BIS"	:	Bureau of Indian Standards
"WBM"	:	Water Bound Macadam
"WMM"	:	Wet Mix Macadam
"BOQ"	:	Bill of Quantities

CLAUSE 105 SCOPE OF WORK

Sub-Clause 105.3 Delete the text of Clause 105.3 and substitute the following:

"The Contractor shall institute and operate a quality management system complying with SP-47 (Quality systems for road bridges) and SP-57 (Quality system for roads). The quality management system shall be described in a Quality Assurance Plan that shall be submitted to the Engineer for acceptance not later than 28 days after the Letter of Acceptance. The costs associated with preparing, implementing and monitoring the quality management system shall be deemed to be covered in the scope of the work. The Quality Assurance Plan shall cover the following items:

- i) The Contractor's organization and management including:
 - The organization of the Contract, including the line of command and communication links between parties involved in the Contract;
 - Names, roles, responsibilities and authority of principles and key personnel;
 - Control of liaison and meetings with third parties;
 - Identification of the Contractor's staff responsible for overseeing each major activity;
 - Contractor's control of sub-contracts;

- Document control;
 - provide a safe, clear and informative system of road signs
 - Program for submission of method statements;
 - Procedures for the preparation, review and adjustment of programmes for the effective progression of the Works;
 - Procedures for the regular review and recording by the Contractor of the quality of the Works;
 - Control of personal selection based on skill and experience;
 - Management review and audit to monitor and exercise adequate control over the implementation of the quality plan.
- ii) The Contractor's detailed method statements and construction procedures for each major activity whether directly controlled or subcontracted including:
- Plant and materials to be used, safety measures, the requirement for skilled labour and/or special supervision and working space;
 - Delivering, handling and storage of materials;
 - Environmental control in respect of pollution, noise, dust, temperature, working hours, traffic control etc.
 - Hold points i.e. the stages at which checks are necessary before continuing;
 - Enable standards of reliability, durability, accessibility, maintainability, quality control and assurance, and fitness for purpose appropriate to a highway of the character of the Project Highway to be achieved throughout the Contract Period
 - Achieve a high standard in the appearance and aesthetic quality of the Project Highway and achieve integration of the Project Highway with the character of the surrounding landscape through both sensitive design and sensitive management of all visible elements including those on the existing road
 - Ensure adequate safety of the Project Workers on the work site.
 - Work instructions, quality control procedures, compliance testing, inspection procedures and work acceptance procedures.
- iii) The Contractor's construction quality control including;
- A statement of the Contractor's organization for quality control;
 - Control of test laboratories;
 - Control of test, measuring and inspection equipment;
 - Document control;

- Procedure for monitoring and recording the inspection, test and approval status of the Works;
- Procedures for the collation of quality records and provision of copies to the Engineer;
- Procedures for the receipt, examination and verification of certificates of conformity and test results for purchased products.”

Sub-Clause 105.5 Contractor shall take steps to minimize the negative impact of construction operations on environment.

Hot Mix Plants should be located at least 1-2 Km from the nearest habitation unless otherwise required by statutory requirements. Vehicles and machinery used for road construction are to be regularly maintained to conform to SPCB (State Pollution Control Board) norms. Blasting as per Indian Explosive Act will be adopted. People living such blasting site should have prior information of operation hours. Workers at blasting site will be provided with ear plugs. Vehicle transporting earth materials will be covered. Water shall be spread to control the dust.

Degraded materials and waste water shall be disposed into the Septic Tank and soak pits etc. The contractor will make arrangement to clean up the spoil as soon as the work finishes in a stretch. If such sites are located outside the ROW, restoration of the site to a level acceptable to the land owner will be done within time period agreed between land owner and the contractor. Spilling of oil and bituminous products during construction phase will be avoided to reduce the chances of contamination of surface as well as ground water. The construction camps shall be situated at places involving least risks of the nature considering the factors like ground slopes, underground water table and shall conform to local building regulations, as applicable.

Construction camps shall be properly located to avoid contamination of water through waste water drainage into river and canals. Seasonal pollution issues may arise when flow of river is slow. To prevent such contamination, waste water generated at camp site will be discharged in soak pits. For human excreta, proper disposal through Septic Tanks or deep trenches will be done.

CLAUSE 106 CONSTRUCTION EQUIPMENT

Add the following sub Para (l) and (m) after sub Para (k)

- i.) Adequate standby equipment including spare parts shall be available.
- ii.) All measuring devices and gauges shall be in good working condition. Measuring devices that can affect product quality shall be calibrated prior to use and at prescribed intervals against certified equipment. Calibration procedures shall be established, maintained and documented and corrective actions taken when results are unsatisfactory. Accuracy and fitness of measuring devices shall be ensured by proper maintenance.

CLAUSE 107 CONTRACT DRAWINGS

Sub-Clause 107.1 Add the following after the end of Para

After careful study of the drawings issued by the employer, the contractor shall where details are not provided or where changes are required due to site conditions, prepare all supplementary and/or additional working drawings based on field/construction information and shall submit the same to the Engineer for approval prior to construction.

CLAUSE 108 SITE INFORMATION

Sub-Clause 108.4 Add this Sub-clause after the Sub-clause 108.3:

“Identification of quarry sites and borrow areas shall be the responsibility of the Contractor. Materials procured from quarry sites and borrow areas identified by Contractor and to be used in Works must comply with the requirements of quality as stipulated in the Technical Specification for particular items of work.”

Clause 109 SETTING OUT

Sub-Clause 109.9 Delete the 2nd and 3rd sentences in Clause 109.8 and substitute the following:

“Setting out of the road alignment and measurement of angles shall be done by using Total Station. Levels shall be taken by Automatic levels with precision micrometer staff having least count of 1mm.”

Clause 110 PUBLIC UTILITIES

Replace whole of this Clause 110 with the following:

Clause 110 ENCUMBRANCES IN CONSTRUCTION AREA, INCLUDING TREES AND UTILITIES

Sub- Clause 110.1 The contractor shall be responsible to coordinate with service provider/concerned authorities for cutting of trees, shifting of utilities and removal of encroachments, etc. and making the site unencumbered from the project construction area required for completion of work. This will include initial and frequent follow-up meetings/actions/ discussions, with each involved service provider/concerned authorities. Payment for cutting of trees and shifting of utilities as required by the concerned department shall be made by the Employer.

Sub-Clause 110.2 Drawings scheduling the affected encumbrance such as trees and services like water pipes, sewers, oil pipelines, cables, gas ducts, electricity lines, accessories, telephone poles and OFC cables, etc. including in the contract document shall be verified by the contractor for accuracy of scope.

Sub-Clause 110.3 The Employer will make payments to the respective service provider/authorities for cutting trees and shifting of utilities, wherever required. The contractor shall obtain necessary approval from such Authorities after payments by the Employer and also in cases where payments are not required to be made for such shifting. The Employer will also write to all concerned department/service provider organization for expedite and facilitating cutting of trees, shifting of utilities and removal of encroachments, etc.

Sub-Clause 110.4 Any services and properties affected by the works must be temporarily supported by the Contractor who must also take all measures reasonably required by the various authorities/ persons to protect their services and properties during the execution of the works. It shall be deemed to be part of the Contract and no extra payment shall be made for the same.

Sub-Clause 110.5 The Contractor may be required to carry out certain works for and on behalf of various bodies and he shall also provide, with the prior approval of the Engineer, such assistance to the various bodies as may be authorized by the Engineer.

Sub-Clause 110.6 Payment

For coordinating the work of cutting of trees, shifting of utilities and removal of encroachments, etc. no separate payment will be made and these will be incidental to the work.

Clause 111 PRECAUTIONS FOR SAFEGUARDING THE ENVIRONMENT

Sub-Clause 111.1 General

Delete the text of Clause 111.1 in its entirety and substitute the following:

“The Contractor shall take all necessary measures and precautions and otherwise ensure that the execution of the Works and all associated operations on site or off-site are carried out in conformity with statutory and regulatory requirements including those prescribed elsewhere in this document. The provisions specified in the Environment Management Plan Report shall be followed as guidelines.

The Contractor shall take all measures and precautions to avoid any nuisance or disturbance arising for the execution of the Works. This shall wherever possible be achieved by suppression of the nuisance at source rather than abatement of the nuisance once generated. All vehicles deployed for material haulage shall be spillage proof.

Haul roads shall be inspected at least once daily to clear any accidental spillage. In the event of any spoil, debris, wastes or any deleterious substance from the Site being deposited on any adjacent land, the Contractor shall immediately remove all such material at no cost to the Contract and restore the affected area to its original state to the satisfaction of the Engineer.”

The Contractor shall be required to carry out all Environmental mitigation measures and monitoring required during execution of works as directed by the Engineer in Charge. It is pointed out that all costs incurred on such measures/ monitoring shall be treated as incidental to the work and shall be deemed to have been included in the cost of item of works covered under the BOQ

Sub-Clause 111.2 Borrow Pits for Embankment Construction

Delete the text of Clause 111.2 and substitute the following:

“Prior approval shall be sought from the concerned State Authorities, and the Contractor shall comply with all local environmental regulations. For all borrow areas, the actual extent of area/zones to be excavated shall be demarcated with the signboards and the operational areas shall be access controlled.

In the case of borrow from tank beds, a regarded/improvement of the inlet channels (at least up to 100m stretch) shall be undertaken in consultation with the concerned state government departments (the Minor Irrigation department and the State RCD) and local bodies. The Contractor shall ensure that excavation of tank beds is uniform over the entire area and that the finished profile of the bed is smooth.

In the case of borrow from the dry highlands, all borrow areas shall be reinstated by the formation gentle side slopes, re-vegetated and connected to the nearest drainage channel to avoid the formation of pools during/after the rainy seasons.

Plant and machinery used in the borrow areas shall conform to State noise emission regulations. All operation areas shall be water sprinkled to contain dust levels to the National Ambient Air Quality Standards.”

Sub-Clause 111.3 Quarry Operations

Delete the text of Clause 111.3 and substitute the following:

“Aggregates shall be sourced only from quarry sites that comply with the local/state environmental and other applicable regulations. Occupational safety procedures/practices for the work force in all quarries shall be in accordance with applicable laws. Quarry and crushing units shall have adequate dust suppression measures, such as sprinklers, in work areas and along all approach roads to the quarry sites. These shall preferable be located on the upwind side.”

Sub-Clause 111.5 Pollution from Hot-Mix Plant and Batching Plants

Delete the 1st sentence of Clause 111.5 and substitute the following:

“Bituminous hot mix plant and concrete batching plants shall be located at least one 1 km away from the sensitive receptors (schools, hospitals, etc.) and at least 500m from urban settlements, unless otherwise required by the statutory requirements.”

Sub-Clause 111.8.2 Air Quality

Add the following text after the end of 1st Para

Construction camps shall have facilities for LPG fuel. The use of firewood shall not be permitted.

Add the following text after the end of last Para

The Contractor shall monitor air-quality once weekly in all operational areas under the project and take the necessary steps to comply with the specified requirements.

Air quality parameters will include SPM, RPM, SO₂, NO_X, HC and CO. operational areas include work sites, haulage roads, hot mix plants, quarries, crushing plants, stockpiles, borrow sites and spoil disposal sites.

Sub-Clause 111.8.3 Water Sources and Water Quality

Add the following text after the end of 1st Para

Bore wells installed and used for the project shall be left in good operating condition for the use local communities. The Contractor shall prevent any interference with the supply to or abstraction from, and prevent any pollution of water resources (including underground percolating water) as a result of the execution of the Works.

Add the following text after the end of last Para

Areas where water is regularly or repetitively used for dust suppression purposes shall be laid to fall to specially constructed settlement tanks to permit sedimentation of particulate matter. After settlement, the water may be re-used for dust suppression and rinsing. The Contractor shall protect all watercourses, waterways, ditches, canals, drains, lakes and the likes from pollution as a result of the execution of the Works. All water and other liquid waste products arising on the Site shall be collected and disposed of at a location on or off the Site and in a manner that shall not cause either nuisance or pollution.

The Contractor shall at all times ensure that all existing stream courses and drains within, and adjacent to, the Site are kept safe and free from any debris and any materials arising from the Works. The Contractor shall not discharge or deposit any matter arising from the execution of the Works into any water except with the permission of the Engineer and the regulatory authority concerned.

Work force camps shall have septic tank and soak away pits. Operational areas like POL storage areas/hot mix plant areas shall comply with local/state environmental regulations and safety procedures. Storage and handling areas shall be impervious and surrounded by an impervious lined drain to catch any accidental spills. Storm water shall be stored in lined holding tanks with oil, grease-tapping facility prior to disposal in to nearby watercourses. The trappings and sludge of holding tanks shall be disposed of in accordance with the procedures approved by the local regulatory authority.

Sub-Clause 111.10 Control and Disposal of Wastes

Add the following text after the end of last Para

Spilling of oil and bituminous products during construction and transport shall be avoided to reduce the chances of contamination of surface as well as ground water.

Degraded materials shall be disposed of in a manner as approved by the Engineer and wastewater shall be disposed into septic tanks and soak pits etc. The Contractor shall make arrangements to cleanup spoil as soon as the work finishes in a stretch. If such sites are located outside the ROW, restoration of the site to a level acceptable

to the land owner(s) will be carried out within a time period agreed between landowner(s) and the Contractor. Separators shall be used to separate POL materials from wastewater prior to discharging to the watercourses or as approved by the Engineer in conformance with directives and guidelines.

Disposal of solid waste materials shall be outlined in a plan for which environmental clearances shall be obtained from State environmental regulatory authorities. Potential locations for solid waste disposal are the natural depressions and borrow areas. The areas used for dumping of uncontaminated debris shall be covered with 300mm soil and shall be planted. Contaminated debris shall be dumped in depressions whose bed must be impervious e.g., stone quarry sites or depressions made impervious with 450mm thick impervious floor apron as per MORT&H Technical Specifications. Each successive 1.0m layers shall be covered with 500mm thick soil layer, and the area will be covered with 300mm thick layer and planted.

After Clause 111.13 Add the following new Clauses 111.14 to 111.17

Sub-Clause 111.14 Haulage Roads

Existing roads used for hauling shall be strengthened and/ or widened by the Contractor in accordance with the requirements for normal and construction traffic. Where such roads do not exist, the Contactor shall construct project specific single lane paved roads in settlement areas and gravel roads in open areas conforming to the Ministry of Road Transport and Highways (MORTH) specifications.

The alignment of the haulage roads shall be fixed to avoid agricultural land to the extent possible. In unavoidable circumstances, suitable compensation shall be paid to the people whose land will be temporarily acquired for the duration of the operations. The compensation shall cover for loss of income for the duration of temporary acquisition and land restoration. Prior to the construction of the haul roads, topsoil shall be stripped and stockpiled for re-use. Material dumping sites shall be access controlled to prevent the unauthorized entry of the people, grazing cattle and stray animals. Haulage roads shall be reinstated upon completion of hauling for the use of local communities.”

Sub-Clause 111.15 Equipment and Vehicles used for the Works

Equipments and vehicles deployed for the construction activities shall not be older than 5 years. Equipments used for road and bridge works shall be based on new technology and shall generate noise and pollutants not exceeding the limits specified by the relevant State Authorities. Vehicles and machineries used for road and bridge works are to be regularly maintained to conform to the National Air Quality Standards.

Sub-Clause 111.16 Noise Control

The Contractor shall consider noise as an environmental constrain in the planning and execution of the Works.

The Contractor shall take all necessary measures so that the operation of all mechanical equipment and construction processes on and off the site shall not cause any unnecessary or excessive noise, taking in to account applicable environmental

requirements. The Contractor shall use all necessary measures and shall maintains all plant and silencing equipment in good conditions so as to minimize the noise emission during construction works.

Any member of the work force likely to be exposed to beyond their threshold noise levels shall be provided with protective equipment, such as earplugs, and shall be rotated every four hours.

Construction operations shall be limited to daytime hours only, particularly in the settlement areas.

Sub-Clause 111.17 Vibration Control

The Contractor shall take measures during construction activities to control the movement of the work force and construction machinery/equipment, and to avoid/minimize activities, which produce vibrations.

CLAUSE 112 ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION

Sub-Clause 112.2 Passage of Traffic along a part of the Existing Carriageway under Improvement

This clause shall read as under:

For widening and strengthening of the existing carriageway where part width of the existing carriageway is proposed to be used for passage of traffic, paved shoulder in a width of at least 1.5m shall be provided on one side of the existing road with the following minimum requirements to be provided by the contractor:

- i) At least one 5.5m lane to remain open to traffic at all times
- ii) The surface used by the through traffic shall at all times be a firm all weather compacted surface free of pot holes and other defects
- iii) The maximum continuous length over which construction under traffic may take place shall be limited to 750m. However, for longer stretches, passing places shall be provided at every 0.75 km interval with at least 50m length.
- iv) The treatment to paved shoulders shall consist of providing 200 mm thick granular base course grading-I Table 400-1 as per Clause 401 covered by 225 mm thick wet mix macadam layer as per Clause 406 and treated with mix seal surfacing (MSS) type B as per Clause 512.
- v) Construction activity shall be restricted to only one side of the existing road.

Sub-Clause 112.3 Passage of Traffic along a Temporary Diversion

Add the following at the end of this Clause.

Where the new highway crosses or joins with an existing state highway, or an established road or cart track, the highway, road or cart track shall be kept open at

all times. In case the Engineer specifically orders to construct and maintain diversion as described below, the same will be paid for.

Sr. No.	Type of Road	Carriageway Width	Unpaved Shoulders Width on each side (m)	Pavement Elements (Compacted)
1.	National Highways & State Highways	7.0 m	2.5	<ul style="list-style-type: none"> • Earthwork • 200 mm granular sub base (Grading-I of Table 400-1) • 225 mm W.B.M. • Prime coat & Tack Coat • Mix seal surfacing Type B.

Drainage should be provided as directed by the Engineer.

The alignment and longitudinal section of diversion including junctions and temporary cross drainage provision shall be as approved by the Engineer.

Sub-Clause 112.4 Traffic Safety and Control

Add the following Para in the end of Clause 112.4

The Contractor shall be fully responsible for the adequate safety of all site operations and methods of construction.

Persistent breaches of the safety provisions by the Contractor and his employees shall constitute a sufficient cause for action.

The Contractor shall also observe the following additional safety provisions. Before taking up, an agreed phased programmed for providing barricades of the approved design as per drawings and other safety measures shall be drawn in consultation with the Engineer.

- The barricading shall be erected on the side of the carriageway portion/ portion of the carriageway where any construction activity is taken up on or alongside of the existing carriageway.
- Flagmen in adequate numbers shall be provided to marshal the traffic on diversion wherever diversion of traffic is resorted to.
- Proper traffic signage in required numbers shall be provided for the information of road users.
- A safety officer shall be nominated to prepare safety programmed and oversee the safety arrangements at site.

Sub-Clause 112.6 Measurements for payment and rate

Replace this clause by following:

All arrangement for traffic during construction except temporary safety barricade as mentioned hereafter, dismantling and clearing debris, where necessary and providing traffic safety and control devices where necessary shall be considered incidental to the works and shall be contractor's responsibility.

Payment for construction of temporary diversion including temporary cross drainage structures, if required, construction of treated shoulder for traffic during construction shall be measured and paid separately as per relevant item in the BOQ. The temporary diversion shall be dismantled and credit for dismantled material shall be taken as per BOQ.

During construction activity for widening of road on hill side, the contractors shall provide rock fall fencing and deepen and widen the existing hill side drain to arrest the falling materials from coming to road surface. The fencing shall be of type as shown in the drawing or as decided by the engineer for safety of road users and workers. After the completion of the work the temporary fencing shall be shifted or removed according to necessity. All works towards providing fencing shifting of fencing clearing accumulated debris arrested by fencing regularly deepening and widening of existing drain etc. shall be considered incidental to the work.

Temporary safety barricade shall be measured in linear meter. All works in excess of quantitative provisions made in BOQ towards providing temporary safety barricade shall be considered as incidental to work and no extra payment shall be admissible for the excess quantity. The contract unit rate for the temporary safety barricade shall be payment in full for the cost all labour, materials, installation, maintenance or replacement, shifting of temporary units from one location to other and refilling the temporary holes made in the ground. Removing debris and all other incidentals to complete the work in all respect, The contractor shall take back these temporary barricades in full quantities after the completion of the project or earlier as per direction of the Engineer by paying at the rate of 50 % of his quoted rate or Rs. 1000 per meter whichever is more as salvage value to the Employer. Recovery for the salvage value shall be made in the third last interim payment certificate. These temporary units shall not be used in any permanent work in the project.

CLAUSE 114 SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK

Sub-Clause 114.2 Item (ii) of Clause 114.2 shall read as follows:

A detailed resource based construction programme including resources planning using computerized critical path network method/PERT in a form, which facilitates control of the progress of the works and consequences of any changes in terms of time. The programme shall also include detailed network, activities for the submission and approval of materials, procurement of critical materials and equipment, fabrication of special products/ equipment and their installation and testing and for all activities of the Contractor that are likely to affect the progress of work etc. including updating all such activities on the basis of decisions taken at the periodic site review meetings or as directed by the Engineer. The Contractor shall submit data via electronic media to the Engineer in a form readily compatible with

Engineer's planning system.

Add the following as item (xix) to sub-clause 114.2:

The Contractor shall prepare detailed construction drawings for each culvert on the basis of the drawings given in Bid Documents and get them approved by the Engineer. The drawings shall be submitted to the Engineer at least 8 weeks before commencement of construction of culverts.

Add the following as item (xx) to sub-clause 114.2

Monthly progress report will be submitted in a format acceptable to the Engineer. The report shall state the progress which has been achieved compared with the planned progress, illustrate delays in proportion to the progress planned, analyses the consequences and state planned corrective measures. Intermediate progress reports may also be required.

The first issue of the detailed construction programme including the detailed description of the system and the procedures shall be submitted to the Engineer for acceptance not later than 28 days after the date of receipt of the letter of acceptance.

The contractor shall submit to the Engineer for approval & consent, the updated & revised programme at every three months interval or as such as directed by the Engineer. The updated & revised programme shall be submitted showing the actual progress achieved (physical & financial) and the effects of the progress achieved on the timing of the remaining work including any change to the sequence of the activities.

Sub-Clause 114.4 Add the following as Clause 114.4

If any 'work' executed by the Contractor does not meet the specifications, it shall be deemed as rejected. The Engineer, in his sole discretion, may consider a proposal by the Contractor to retain, the element or part of the 'work'. The Contractor's proposal shall be supported by calculations, drawings and other data to prove the soundness of the proposal and shall clearly describe the additional measures required to ensure the intended performance of the 'work'.

Such corrective measure shall be carried out at the contractor's cost and risk.

CLAUSE 120 FIELD LABORATORY

Sub-Clause 120.1 Scope

Add the following at the end of the clause.

This facility will be provided and maintained by the Contractor, as incidental to work and no separate payment shall be made for this item.

Sub-Clause 120.2 Description

Replace “electric supply etc.” to the second sentence of first paragraph by “including uninterrupted power supply etc.”

Add the following at the end of this Clause:

“There shall also be provided a concrete paved area, for storing samples adjacent to the laboratory, of about 300 sqm and another 200 sqm shall be suitably roofed with open sides giving protection against sun and rain.

Within 14 (fourteen) days of the commencement date, the Contractor shall prepare and submit a layout plan and details of the laboratory building and make/supplier of the equipment to the Engineer for his approval.

The field laboratory to be provided under the Contract shall be handed over to the Engineer in finished and fully equipped condition not later than 2 months after the receipt of Notice to Commence Work, and the field laboratory with all equipment/instrument shall be to the entire satisfaction of the Engineer. During the 2 months period starting from the Notice to Commence work, the laboratory tests shall be performed in another laboratory proposed by the Contractor and approved by the Engineer.

Sub-Clause 120.3 This clause stands deleted.

Sub-Clause 120.4 This clause stands deleted.

Table 100-2 Laboratory Equipment

S. No.	Sub No.	Item, Specifications	Nos. required
A: General			
i)		Balance	
	(a)	5 kg to 20 kg capacity semi -self-indicating Electronic Type –Accuracy 1 gm.	1
	(b)	500 gm. capacity semi self indicating Electronic Type – Accuracy 0.01 gm.	1
	(c)	Chemical balance 100gm capacity - Accuracy 0.0001gm	1
	(d)	Pan balance 5 kg capacity - Accuracy 0.5 gm.	1
	(e)	Platform Scale – 300 kg capacity	1
ii)		Ovens – Electrically operated, thermostatically controlled	
	(a)	From 0°C to 220°C – Sensitivity	

S. No.	Sub No.	Item, Specifications	Nos. required
iii)		Sieves, as per IS 460-1962	
	(a)	IS Sieves 450 mm internal dia. of sieve sets as per BIS of required sieve sizes complete with lid and pan	1 set
	(b)	IS sieve 200 mm internal dia. (brass frame and steel or brass wire cloth mesh) consisting of sieve sets of required sieve sizes complete with lid and pan	2 set
iv)		Sieve shaker capable of taking 200 mm and 450 mm dia. Sieves electrically operated with time switch assembly (As per BIS)	1
v)		200 tones compression testing machine	1
vi)		Stop watches 1/5 sec. Accuracy	2
vii)		Glassware comprising of Beakers, Pipettes, dishes, measuring cylinders (100 to 1000 cc capacity) glass rods and funnels, glass thermometers range 0oC to 100oC and metallic thermometers range 300oC	2 Nos. each
viii)		Hot plates 200 mm dia (1500 watt.)	6
ix)		Enamel trays	
	(a)	600 mm x 450 mm x 50 mm	2
	(b)	450 mm x 300 mm x 40 mm	2
	(c)	300 mm x 250 mm x 40 mm	2
	(d)	Circular plates of 250 mm dia.	2
x)		Water Testing Kit	1

Sub-Clause 121.3.2 for Soils and Aggregates

B: For Soils and Aggregates			
i)		Water still, 3 liter/hr. with fittings and accessories	-
ii)		Liquid limit device with Casagrande and ASTM grooving tools as per IS: 2720	1
iii)		Sampling pipettes fitted with pressure and suction inlets, 10 ml Capacity	1 set
iv)		Compaction apparatus (Proctor) as per IS: 2720 (Part 8) complete with collar, base plate and hammer	1 set
v)		Modified AASHTO compaction apparatus as per IS. 2720 (Part 7) 1980 or Heavy Compaction Apparatus as per IS complete with collar, base plate and hammer	1 set

B: For Soils and Aggregates			
vi)		Sand pouring cylinder with conical funnel and tap and complete as per IS 2720 (Part 28) 1980 including modified equipment	2
vii)		Sampling tins with lids 100 mm dia x 75 mm ht ½ kg capacity and miscellaneous items like moisture, tins with lid (50 grams) etc.	4
viii)		Lab CBR testing equipment for conducting CBR testing, load frame with 5 Ton capacity, electrically operated with speed control as per IS: 2720 (Part 16), and consisting of following:	1 set
	(a)	CBR moulds 150-mm dia – 175-mm ht complete with collar, base plate etc.	6
	(b)	Tripod stands for holding dial gauge holder	4
	(c)	CBR plunger with settlement dial gauge holder	1
	(d)	Surcharge weight 147-mm dia 2.5 kg weight with central hole	6
	(e)	Spacer disc 148-mm dia, 47.7-mm ht. With handle	2
	(f)	Perforated plate (Brass)	2
	(g)	Soaking tank for accommodating 24 CBR moulds	2
	(h)	Proving rings of 1000 kg, 2500 kg and 5000 kg capacity	1 each
	(i)	Dial gauges, 25 mm travel- 0.01 mm/division	2
ix)		Standard Penetration test equipment	1
x)		Nuclear Moisture Density Meter or equivalent	1
xi)		Speedy moisture meter complete with chemicals	1
xii)		Unconfined compression test apparatus	1 set
xiii)		Aggregate Impact Test Apparatus as per IS 2386 (Part 4) 1963	1
xiv)		Los Angeles abrasion Test Apparatus as per IS 2386 (Part 4) 1963	1
xv)		Riffle Box of Slot size of 50mm as per ASTM C-136	1
xvi)		Dynamic Cone Penetrometer	1
xvii)		Hydrometer with high speed stirrer and jars	2 sets
xviii)		Post-hole augur (to BS-812)	3

Sub-Clause 121.3.3 For Bitumen and Bitumen Mixes

C: For Bitumen and Bituminous Mixes		
i)	Constant temperature bath for accommodating bitumen test specimen, electrically operated and thermostatically controlled, 50 liter capacity temp. range ambient 80° C	1
ii)	Penetrometer automatic type, adjustable weight arrangement and needles as per IS. 1203 – 1978	1
iii)	Solvent extraction or centrifuge type apparatus complete (AASHTO, T-164) with extraction thimbles with stocks of solvent and filter paper	1
iv)	Laboratory mixer including required accessories about .02 cum capacity electrically operated fitted with heating jacket	1
v)	Marshall compaction apparatus automatically operated as per ASTM 1559-62 T and complete with electrically operated loading unit, compaction pedestal heating head assembly, dial micrometer and bracket for flow measurement, load transfer bar, specimen mould 100 mm dia. (4 in) with base plate, collars, specimen extractor, compaction hammer 4.53 kg (10 lb.) x457 mm (18 in) fall	1 set
vi)	Distant Reading Digital Thermometer for Measuring Temperatures in Asphaltic Mixes	As required
vii)	Riffle Box	1
viii)	Automatic Asphalt Content Gauge [Nuclear or equivalent]	1
ix)	Thin film Oven test apparatus to the requirement of AASHTO T 179, including accessories	1
x)	Ring Ball Apparatus as per IS 1205- 1978	1
xi)	Asphalt Institute Vacuum Viscometer as per IS 1206(part II) – 1978	1
xii)	BS U- Tube Modified Reverse Floro Viscometer IS 1206(Part III) – 1978	1
xiii)	Apparatus for Determination of Ductility Test as per IS 1208 – 1978	1
xiv)	Pen Sky – Martars closed Tester for testing flash and fire point as per IS 1209 – 1978.	1
xv)	Apparatus for Float Test – IS – 1210 – 1978	1
xvi)	Apparatus for Determination of water content (Dean and Shark Method) IS – 1211 – 1978	1

C: For Bitumen and Bituminous Mixes			
xvii)		Apparatus for Determination of Loss on Heating IS – 1212-1978.	1
xviii)		Apparatus of Determination of specified Gravity IS-1202-1978	1
xix)		Core cutting machine with 100mm dia. Diamond cutting Edge	1
xx)		Apparatus for Elastic Recovery test for Modified Bitumen	1
xxi)		Apparatus for Storage Stability test for Modified Bitumen	1
xxii)		Apparatus for Separation test for modified bitumen	1

Sub-Clause 121.3.4 for Cement, Cement Concrete and Materials

D: For Cement, Cement Concrete and Materials			
i)		Water still	1
ii)		Vicat needle apparatus for setting time with plungers, as per IS. 269-1967	1
iii)		Moulds	
	(a)	150 mm x 300 mm ht cylinder with capping component	As required
	(b)	150mmx150 mm x150mm cubical for compressive strength	As required
	(c)	150mmx100 mm x600mm beam for flexural strength	As required
iv)		Concrete permeability apparatus	1
v)		High frequency mortar cube vibrator for cement testing	1
vi)		Concrete mixer power driven, 1 cu ft capacity	1
vii)		Variable frequency and amplitude vibrating table size 1 meter x 1 meter, as per the relevant British Standard	1
viii)		Flakiness & Elongation test apparatus	2each
ix)		Aggregate impact test apparatus as per IS 2386 (Part 4) 1963	2
x)		Los Angeles abrasion apparatus as per IS. 2386 (Part 4) 1963	1
xi)		Flow table as per IS 712-1973	1
xii)	(a)	Equipment for slump test	2

D: For Cement, Cement Concrete and Materials			
	(b)	Compaction factor test equipment	1
xiii)		Equipment for determination of specific gravity for fine and coarse aggregate as per IS 2386 (Part 3) 1963	2
xiv)		Core cutting machine with 150 mm dia. Diamond cutting edge	1
xv)		Needle vibrator	1
xvi)		Vibrating hammer as per BS specification	1
xvii)		Air entrainment meter ASTM C - 231	1
xviii)		0.5 Cft, 1 Cft cylinder for checking bulk density of aggregate with tamping rod	1
ix)		Soundness testing apparatus for cement	1
xx)		Compression testing machine with the provision of flexural attachment and accessories for testing flexural beam	1
xxi)		Chemicals solutions and consumable	As reqd.
xxii)		Chloride Testing kit for chemical analysis of chloride content.	1
xxiii)		ION Exchange kit for rapid determination of sulphate content.	1
xxiv)		Electronic PH meter	1

Sub-Clause 121.3.5 For Control of Profile and Surface Evenness

E: For Control of Profile and Surface Evenness			
i)		Total Station with all accessories	1 No.
ii)		Precision Automatic Level	1 set.
iii)		Distomat or equivalent	1 set.
iv)		Theodolite – Electronically operated with computerised output attachment	1 set.
v)		Precision Staff of 1mm least count	2 Sets.
vi)		3 metre straight edge and measuring wedge	1 set.
vii)		Camber templates 2 lane	
	(a)	Crown type cross-section	1 set.

E: For Control of Profile and Surface Evenness			
	(b)	Straight run cross-section	2 sets.
viii)		Steel tape	
	(a)	5 m long	2 Nos.
	(b)	10 m long	2 Nos.
	(c)	20 m long	2 Nos.
	(d)	30 m long	2 Nos.
	(e)	50 m long	2 Nos.
ix)		Roughometer (Bump Integrator)	1 Set.

Note: The laboratory set-up must be complete including a set of reference standards, adequately staffed and operational to the satisfaction of the Engineer not later than 2 months from the date of receipt of Notice to commence the works.

The Contractor shall be responsible for the provision of adequately experienced and qualified laboratory staff, in sufficient numbers to be able to meet all testing requirements to the approval of the Engineer, and for the supply of all transportation of staff, testing equipment and samples necessary to allow the testing to be performed in a time scale compatible with the needs of the Site.

Contractor shall arrange to maintain the laboratory in satisfactory manner and will carry stocks of spare equipment and laboratory consumables until the issue of Taking over Certificate.

The contractor shall provide any other equipment required to check quality as per the requirement of specification in addition to the above.

Sub-Clause 120.5 Rate

“This Clause shall be read as under:”

The construction, supply, installation, maintenance, and operation including all consumables like chemicals & reagents etc., and all other expenses involved in connection thereto for the field laboratory shall be incidental to the work, and shall not be paid for separately.

SECTION 200 SITE CLEARANCE

CLAUSE 201 CLEARING AND GRUBBING

Sub-Clause 201.1 Scope

Replace with following Para:

This work shall consist of cutting, excavating, removing, and disposing of all materials such as trees of girth up to 300 mm, bushes, shrubs, stumps, roots, grass weeds, rubbish etc. and top soil up to 150 mm, which in the opinion of Engineer is unsuitable for incorporation in the work including draining out stagnant water if any from the area of road land, drain, cross drainage structure and other area as specified in the drawing or instructed by Engineer. It shall include necessary excavation by harrow discs or any other suitable equipment, back filling of the pits by suitable soil, resulting from uprooting of trees & stumps and making the surface in proper grade by suitable equipment and compacted by power roller to required compaction as per Clause 305.3.4. The work also includes handling, salvaging and disposal of cleared material. Clearing and grubbing shall be performed less than one month in advance of earthwork operation and in accordance with requirement of these specifications.

Sub-Clause 201.5 Measurements for Payment

Delete the 2nd sentences in first paragraph and replace as under:

Cutting of trees up to 300 mm in girth measured at 1 meter above ground including removal of stumps and roots and trimming of branches of trees extending above the roadway shall be considered incidental to the clearing and grubbing operations and no separate payment shall be mode for the same.

Removal of stumps & roots of trees of girth above 300mm trees cut by other agencies and back filling to required compaction as specified in this clause shall be measured in terms of number separately on the basis of girth size of stumps of trees as given in Bill of Quantities and will be payable. For the purpose of stump removal, girth size shall be measured 150mm above ground.

CLAUSE 202 DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES/ PAVEMENTS

Sub-Clause 202.5 Disposal of Materials

The first paragraph of the sub clause shall read as below

All materials obtained of dismantling/milling shall be the property of the Employer and, the Contractor shall be free to use this material in work or he may sell/dispose of the material to as desired/deemed fit by him, for which he shall quote a rate for rebate against the respective items of BOQ.

Contractor may use dismantled / milled road crushed material on as is where is basis

by suitably modifying the material, or by crushing the material, or by breaking the material, and screening the same, after effecting due rebate in the BOQ, provided it meets the specifications and is approved by the Engineer.

Sub-Clause 202.6 Measurements for Payment

This Clause shall read as:

The work of dismantling structures shall be paid for in units indicated below by taking measurements before and after, as applicable:

- | | | |
|------|--|-----------------|
| i) | Dismantling brick / stone masonry / plain concrete / reinforced concrete including reinforcement. |cum |
| ii) | Dismantling pavement structures such as Sub base / Base Course, Bituminous wearing course, Concrete wearing course |cum |
| iii) | Dismantling pipes, guard rails, road kerbs, gutters and fencing | ..running metre |
| iv) | Dismantling Guard Stones/KM post/Hectometre Stones |Nos |
| v) | Dismantling RCC railing | ..running metre |
| vi) | Dismantling of railing kerb | ..running metre |
| vii) | Dismantling of Stone pitching/ boulder apron/ brick soling/ stone soling |cum |

Sub-Clause 202.7 Rates

Add at the end of this sub clause:

The contract unit rates for various items of rebate shall be on the full quantities obtained from dismantling.

SECTION 300 EARTHWORK, EROSION CONTROL AND DRAINAGE

CLAUSE 301 EXCAVATION FOR ROADWAY AND DRAINS

Sub-Clause 301.1 Scope

Add the following as second paragraph under this clause:

“The work shall also include excavation for channel training at culverts/bridges, excavation of existing shoulders and medians for purposes of widening the pavement and excavation of existing embankment for reconstruction to specification.”

Sub-Clause 301.2.1 Classification

The Para (a) under this clause shall read as under:

“(a) Soil

This shall comprise top soil, turf, sand, silt, loam, clay, mud, black soil, soft shale or loose moorum, a mixture of these and similar material which yields to the ordinary application of pick, spade and stroke/or shovel, rake or other ordinary digging implement, including excavation of unsuitable soil (as described in Clause 305.2). Removal of gravel or any other nodular material having dimension in any one direction not exceeding 75 mm occurring in such strata shall deemed to be covered under this category. Conglomerates and boulders not requiring blasting having maximum dimension in any direction up to 300 mm and excavation of unsuitable soils (as described in clause 305.2) shall also be covered under this category”.

Delete “and Conglomerates” from first line of Para b (i)

Delete Para b (iv)

Sub-Clause 301.3.3 Excavation – General

The following paragraph is added to the sub-clause 301.3.3

“Temporary support to the sides of the excavation, necessary to support the foundation of adjoining structures and to prevent any ground movement shall be provided by the Contractor. Where temporary supports are provided these shall be designed & removed such that no ground movement occurs on removal. The Contractor shall submit his proposal in this respect to the Engineer for approval prior to commencement of the excavation”.

Sub-Clause 301.3.7 Excavation of road shoulders/verge/medians for widening of pavement or providing treated shoulders

The title of this Clause shall read as under:

“Excavation of road shoulders/verge & medians for widening of pavement or for providing treated/paved shoulders and medians”.

The first sentence of this Clause shall be replaced as under:

“In works involving widening of existing pavements or providing paved shoulders, the existing shoulders/verge/median shall be removed to its full width and upto top of subgrade. The subgrade material within 0.5m from the lowest part of the pavement crust for widened portion or paved shoulders shall be loosened and re-compacted as per Clause 305 to a density not less than 97% of maximum dry density determined according to IS:2720 (Part 8). Any unsuitable material encountered in this portion of sub-grade shall be removed and replaced with suitable material and compacted in accordance with Clause 305”.

Clause 301.3.11 Use & Disposal of excavated materials

Delete this sub-clause and replace with:

“All the excavated materials shall be the property of the Employer. Suitable material obtained from the excavation of the roadway, shoulders, verges, drain, cross drainage works, etc. shall be used for:

- i) Filling for roadway embankments with all lifts and leads
- ii) Filling existing pits in the right of way as directed by the Engineer, including levelling and spreading with all lifts and leads
- iii) For landscaping of the road as directed by the Engineer, including levelling and spreading with all lifts and leads

Excavated rock shall be available to the contractor for using in the manner as he desires (other than the above items of work) after affording the rebate against the respective items of BOQ.

The contractor shall remove unsuitable and surplus material, which, in the opinion of the Engineer cannot be used in the works, from site and disposed of at the approved location in accordance with all statutory requirements as approved by the Engineer with all lifts and leads and no extra payment shall be made for the same. Area of dumping shall be arranged by the contractor.

Sub-Clause 301.6 Preparation of Cut Formation

Second Para shall be read as under:

“In rock formation, the rock shall be cut 100mm below the specified elevation of base WMM and the surface irregularities shall be corrected. The gap between rock cut and base of WMM shall be filled with 100mm thick granular sub-base as per grading-I of Table 400-1 of Clause 401. The unsuitable material shall be disposed of in accordance with Clause 301.3.11.”

Sub-Clause 301.8 Measurements for Payment

In first line of first Para add “and drains” after the word “roadway”

Delete the last Para from “works involved.....” and substitute:

“Works involved in excavation for roadway and drains shall be measured in unit indicated below:

- Excavation in all classes of soil including marshy soil ...cum
- Excavation in ordinary rock ...cum
- Excavation in hard rock with or without blasting ...cum
- Preparing Rocky Subgrade ...sqm
- Loosening and re-compacting of sub-grade ...cum

Sub-Clause 301.9 Rates

Sub-Clause 301.9.1

Add extra item after item (vii)

“(viii) The removal from site and disposal of all surplus or unsuitable materials obtained from excavation operations, which, in the opinion of the Engineer cannot be used in the Works, shall also be included in the Contract unit rates.”

Sub-Clause 301.9.2 This Clause shall read as under:

“The contract unit rate for loosening and re-compacting at subgrade level shall include full compensation for loosening to the specified depth, removing the loosened soil outside the roadway excavation rolling the surface below, breaking the clods, spreading the excavated soil in layers, watering where necessary and compacting to the requirements.”

Sub-Clause 301.9.3

Insert “including marshy soil” after words “unsuitable material” in the second line of this sub-clause.

Sub-Clause 301.9.6

Add new Sub Clause after 301.9.5 as under;

The Contract unit rate for rebate of materials obtained from excavation/cutting shall take into account for full compensation to be made by the Contractor who shall be responsible for arranging approval, payment of royalty and complying the requirement of mining department and other authorities of Central / State Government for reuse of materials obtained for rock cutting”.

CLAUSE 304 EXCAVATIONS FOR STRUCTURES

Sub-Clause 304.3.2 Excavation

At the end of 1st paragraph of Clause 304.3.2 insert the following additional sentences:

“The Contractor shall ensure the stability and structural integrity of adjacent existing foundations and structures and if necessary shall, at his own expense, install temporary or permanent sheet piles, coffer dams, shoring or similar as support or protection to the satisfaction of the Engineer.”

CLAUSE 305 EMBANKMENT CONSTRUCTION

Sub-Clause 305.2 Material and General Requirements

Sub-Clause Physical Requirements:

305.2.1 Add at the end of the 1st paragraph of Sub Clause 305.2.1.1 insert the following additional sentence;

“Use of flyash available from Thermal Power Station located within 100 kms of work may be required. The embankment with flyash shall be executed as per IRC: SP: 58:2001.

Sub-Clause

305.2.1.2 Add the following at the end of Sub-Clause:

“Soils having medium and high swelling potential shall be defined on the basis of Liquid Limit, Plastic Limit, Shrinkage Limit, Gradation, Free swelling Index, Field dry Density and Field Moisture Content and types of Clay minerals present in the soil and as directed by the Engineer. The location and the extent of these soils with medium to high swelling potential should be defined as directed by the Engineer.”

Sub-Clause

305.2.1.4 Delete second sentence “However, the Engineer Requirements of these Specifications”.

Sub-Clause

305.2.2.4 Compaction Requirements

Delete Table 300-2 and substitute the following:

Table 300-2

Compaction Requirements of Embankment and Subgrade

S. No.	Type of Work/Material	Relative Compaction as %age of maximum laboratory dry density as per IS 2720 (Part 8)
1	Subgrade and earthen shoulders	Not less than 97%
2	Embankment	Not less than 95%
3	High Embankment (Height >6m)	Not less than 97%
4	Expansive clays	Not allowed
5	Design CBR of Subgrade & Shoulder shall be as per Drawing, but not less than 6%	

Replace the last part of Sub-Clause 305.2.2.4 (after Table 300-2) with the following:

The contractor shall at least 7 working days before commencement of construction of embankment and the subgrade; submit the following to the Engineer for approval:

- i) The values of maximum dry density and optimum moisture content obtained in



accordance with, IS: 2720 (Part 8) for each fill material proposed to be used in the construction of embankment and subgrade.

- ii) The graphs of Density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.
- iii) The dry density-moisture content-CBR relationships, heavy compactive efforts conforming to the IS 2720 (part 8) for each of the fill material proposed to be used in the sub grade.

The above information shall form the basis for compaction only upon its approval by the Engineer.”

Sub-Clause Add the following new sub-clause:

“Construction of embankment with flyash / pond ash available from coal or lignite thermal plants as waste materials.

Construction of Embankment using Fly ash / Pond ash shall be carried out complete as per IRC: SP: 58 – 2001”.

Sub-Clause 305.3 Construction Operations

Sub-Clause 305.3.1 Setting Out

Add the words “with minimum 300 mm wider” after the words “sufficiently wider” in the fourth line of the clause.

Sub-Clause Compacting Ground Supporting Embankment/Subgrade

305.3.4 Para 1 of this clause shall be read as

“Where necessary the original ground shall be leveled, scarified, mixed with water and then compacted by rolling to facilitate placement of first layer of embankment so as to achieve minimum dry density as given in Table 300-2”.

Add at the end of Para 2

“Backfilling layers in pits, trenches and below the original ground are to be compacted to the relative natural ground density. The natural ground density shall be determined by conducting field density tests at three widely spaced locations along the central line of the proposed additional carriageway at a depth between 0.5m to 1.0m. Samples of natural ground are collected at each location, and are tested in accordance with IS: 2720 (Part 8). The relative density (i.e. the percentage of the field dry density to the laboratory maximum dry density) is assessed for each sample, and the greatest relative density obtained is selected as the “natural ground density”. If the natural ground density is less than 90% then these are to be compacted after necessary watering so as to achieve not less than 90% of relative compaction”.

“Where necessary to facilitate compaction of the subgrade to 97% relative compaction as stated above, a further depth below the subgrade of maximum

thickness of 0.2m shall be loosened, watered and compacted in accordance with Sub Clause 305.3.5 and 305.3.6 to not less than 95% of dry density determined in accordance with IS: 2720(Part-8)".

Sub-Clause

305.3.6 Compaction

The second Para of this Clause shall read as under:

"Vibratory roller of not less than 80-100 KN static weight with plain or pad foot drum or pneumatic tyre roller of 300 KN weight having tyre pressure of at least 7 kg/sqcm shall be used for compaction."

Insert the following sentence before the last sentence of Paragraph 4.

"The co-relation between sand replacement densities and nuclear gauge densities shall be based on trials with minimum 30 coherent density measurements".

Sub-Clause 305.9 Rates

Sub-Clause 305.9.1

Add "including removal of topsoil after word "materials" appearing in first line of item (v).

Insert "including removal and replacement of marshy soil" after words "unsuitable material" appearing in the second line of item (iii).

Sub-Clause Add new Sub-Clause after Sub Clause 305.9.10 as under;

305.9.11 The contract unit rate for construction of embankment with suitable material obtained from roadway excavation within Right of Way (ROW) shall be payment in full for carrying out the required operation including full compensation for items under Clause 305.9.1 excluding Sub Clause (i) & (x) after the suitable material has been received as provided in Clause 301."

Clause 306 SOIL EROSION AND SEDIMENTATION CONTROL

Sub-Clause 306.4 Measurements for Payment

Substitute Clause 306.4 as follows:

"All temporary sedimentation and pollution control works shall be deemed as incidental to the earthwork and other items of work and as such no separate payment shall be made for the same."

Sub-Clause 306.5 Rates

This clause shall be deleted.

Clause 309 Surface/Sub-Surface Drains

Sub-Clause 309.2 Surface Drains

Add the following paragraphs after end of the fourth Para of this clause.

“Drains in super-elevations shall be constructed as per drawings. Geotextile membrane if specified for these drains shall conform to Sub-Clause 702 of Section 700”.

“The roadside land between toe of road embankment & drain shall be levelled & sloped towards the drain as per drawing.”

Sub-Clause 309.3 Sub-Surface Drains

Sub-Clause 309.3.1 Scope

The first sentence of this clause should read as:

“Sub-surface drains shall be close jointed perforated pipes, surrounded by granular material laid in a trench to drain the pavement courses.”

Sub-Clause 309.3.2 Materials

Grading requirements for filter material shall conform to Class I of Table 300-3.

Sub-Clause 309.3.2.1 Pipe

The first and second sentences of this clause shall read as:

“Perforated pipes for the drains are of PVC. The size and grade of the pipe to be used is as specified in the drawing.”

Sub-Clause 309.3.4 Laying of Pipe and Backfilling

Delete Para 4 of this clause.

Sub-Clause 309.4 Measurements for Payment

This Clause shall read as:

“Construction of drains shall be measured as finished work in position as below:

- | | | |
|--|-------|-----------------------|
| a) Unlined ditch drain | ..... | as per Clause 301 Cum |
| b) Semi-Circular median drain as shown in the drawing with PCC M20, NP2 pipe, levelling concrete M15 and filter media. | ..... | running metre |
| c) Open cross-drain in paved median as per drawing with PCC grade M-20 & levelling concrete M-15. | ..... | running metre |
| d) Paved open/Covered drain | | |

(i) Levelling concrete M-15	.....	cum
(ii) Course rubble masonry	.....	cum
(iii) Stone pitching grouting with CM 1:3	.....	cum
(iv) PCC/ RCC grade M-20	.....	cum
(v) Steel Reinforcement	.....	MT
(vi) Precast perforated slab	.....	Nos.
(vii) Catchpits/ inspection chambers	.....	Nos.
(viii) RCC pipes	.....	running metre
e) Sub-surface drains	.....	running metre
f) Iron grating	.....	Nos.

SECTION 400 SUB-BASES, BASES (NON BITUMINOUS) AND SHOULDERS

General

Sub clause (i) of clause 401.7 stands deleted and remaining sub paras (ii) to (v) are renumbered as (i) to (iv).

Sub clause (i) of clause 405.7 stands deleted and remaining sub paras (ii) to (v) are renumbered as (i) to (iv).

The provision of clause 401.8 (i) to (v) be read as "Clause 401.8 (i) to (iv)" in the sub clauses 402.8, 403.8, 404.7, 407.7 and 408.7

Clause 401 GRANULAR SUB BASE

Sub-Clause 401.2 Materials

Sub-Clause 401.2.1 Para 1 of this Clause shall be read as under:

"The material shall be free from organic or other deleterious constituents and conform to the Grading I given in Table 400-1 with the percentage passing 0.075mm size restricted to 5%. The portion of the total aggregate passing 4.75 mm sieve shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS: 2720 (Part – 37).

Delete the eighth sentence beginning with "where the sub-base is laid in two layers as upper sub-base and lower sub-base, the thickness of each layer shall not be less than 150mm".

Sub-Clause 401.2.2

Add at the end of this clause as under:

The Contractor shall, at least 21 working days before the commencement of the construction of the sub-base course, submit to the Engineer, the results for approval of the laboratory testing on the physical properties defined above. The construction of the sub-base course shall be taken up only upon the Engineer's approval of the material.

Sub-Clause Add new Sub-Clause after Sub Clause 401.3.3 Strength of Sub-base as under:

It shall be ensured prior to actual execution that the material to be used in the sub-base has a minimum CBR value of 30% and other physical requirements when compacted and finished.

When directed by the Engineer, this shall be verified either by performing CBR tests in the laboratory or by conducting DCP test. The CBR tests shall be conducted on specimen soaked for 4 days and compacted to 98% of the maximum dry density as per IS: 2720 (Part 8).

When decided by the Engineer – Dynamic Cone Penetration (DCP) tests shall be performed in-situ as per TRRL (UK) Road Note No. 31 and in situ CBR calculated by co-relation given by TRRL.

Clause 406 WET MIX MACADAM SUB BASE/BASE

Clause 406.2.1.1 Physical requirement

Delete the second sentence beginning with "If crushed gravel and ending with fractured faces" and add as under:

"If crushed boulders are used, not less than 90% by weight of crushed boulders retained on 4.75 mm sieve shall have at least two fractured faces.

The constituents of the aggregates shall be produced by integrated crushing and screening plant (Impact or Cone type of capacity 200T/hour) and, unless otherwise instructed by the Engineer, crushing shall be carried out in at least two stages. The fraction of material passing through 4.75mm sieve shall also be crusher run screening only."

Add the following at the end of the paragraph:

Soundness test shall be carried out in accordance with IS: 2386 (Part 5) 1963. The average loss of weight of coarse aggregate after "5 cycles shall not exceed 12% when tested with sodium sulphate and 18% when tested with magnesium sulphate as specified in IS: 383.

From Table 400 – 10 delete at the bottom of the table asterisk and modify as under:

"The aggregate should satisfy both the tests a) Los Angeles Abrasion Value
b) Aggregate Impact value"

Sub-Clause 406.3.4 Spreading of Mix

Substitute 1st sentence of Para 2 of clause 406.3.4.

“The mix shall be spread by a WMM paver”.

Sub-Clause 406.3.5 Compaction

Delete second sentence of Para 1 of Clause 406.3.5.

Clause 409 CEMENT CONCRETE KERB AND KERB WITH CHANNEL

Sub-Clause 409.5 Construction Operations

Sub-Clause 409.5.1 Add at the end of the first sentence “or as shown in the drawings”

Sub-Clause 409.6 Substitute

“Cement concrete kerb/kerb with channel shall be measured in linear metre. Foundation of kerb, where separately provided, shall be measured in cubic metre.”

Clause 409.7 This Clause shall read as under:

The contract unit rates for cement concrete kerb / kerb with channel shall be payment in full compensation for furnishing all materials, labour, tools equipment for construction and other incidental cost necessary to complete the work. Foundation for kerb, wherever provided, shall be paid separately as per contract.

SECTION 500 BASE AND SURFACE COURSES (BITUMINOUS)

General

Sub Para (i) of clauses 501.8.8.2 stands deleted and remaining sub pares (ii) to (x) are renumbered as (i) to (ix).

The provision “clause 401.7 (i) to (v)” be read as “Clause 401.7 (i) to (iv) in the clauses 502.8 & “clause 401.8 (i) to (v)” be read as “Clause 401.8 (i) to (iv) in the clauses 503.8.

Sub-Clause 501.2 Materials

Sub-Clause 501.2.2 Delete “Crushed gravel or other hard material” from First line of Para 1 and replace with “crushed boulders”

Replace word “crushed gravel” in Para 2 with “crushed boulders”

Sub-Clause 501.6 Compaction

Para 2, Line 11; sentence starting with “the intermediate rolling” is replaced by “Intermediate rolling shall be done with a Pneumatic roller of 150-250kN weight having a tyre pressure of at least 0.7Mpa.

Add new Para,

“Rolling shall be continued till the density achieved, satisfied the requirement of Clause 903.4.2.”

Sub-Clause

501.8.8.2 Add the following at the end of Para (viii)

Payment of extra bitumen shall be made on the basis of the prevailing rate of

bitumen.

CLAUSE 502 PRIME COAT OVER GRANULAR BASE

Sub-Clause

Add the Sub-Clause 502.2.5 Choice of Primer after 502.2.4

This clause shall be read as under:

The primer shall be medium setting bitumen emulsion and shall be refinery produced. The particular grade to be used for the work shall be got approved by the Engineer."

CLAUSE 503 TACK COAT

Sub-Clause

503.2 Materials

This clause shall be read as under:

"Binder: The binder used for tack coat shall be medium setting bitumen emulsion and shall be refinery produced. The particular grade to be used for the work shall be got approved by the Engineer."

CLAUSE 505 DENSE GRADED BITUMINOUS MACADAM

Sub-Clause 505.2.1 Bitumen

This Clause shall be read as under:

The binder shall be viscosity grade VG-30 bitumen conforming to IS:73-2006.

Sub-Clause 505.2.2 Coarse Aggregates

Delete "Crushed Gravel or other hard material" from 1nd line of 1st para and replace with "crushed boulders".

Replace word "crushed gravel" in para 2 with "crushed boulders"

Add the following at the end of this clause:

"The constituents of the aggregates shall be produced by integrated crushing and screening plant (Impact or Cone type of capacity 200T/hour) and, unless otherwise instructed by the Engineer, crushing shall be carried out in at least two stages. The fraction of material passing through 4.75mm sieve shall also be crusher run screening only."

Sub-Clause 505.2.3 Delete the words “or Naturally Occurring Mineral or a Combination of the two” appearing in the first sentence of the clause.

Sub-Clause 505.2.4 the first sentence of this clause shall read as “Filler shall consist of finely divided hydrated lime or cement as approved by the Engineer”

Sub-Clause 505.2.5 Aggregate Grading and Binder Content

From the Table 500 – 8, replace at bottom of the table against Asterisk (*) with the following:

“Aggregate should satisfy both the tests Los Angeles abrasion value and aggregate impact value”

In Table 500-10, the following may be substituted:

Grading	1	2
Layer Thickness	>75mm to 100mm	50-75mm

Sub Clause 505.3 Mix Design

Sub-Clause 505.3.1 Requirement for the Mixture

Add the following requirements to the list of Table 500-11:

Water sensitivity (ASTM D1075): Retained stability (Ratio of Marshal Stability for 24 h Immersion and 30min Immersion in water at 60 degree centigrade temperature) = not less than 75 %

Filler- Bitumen ratio = 0.6 to 1.2 (Filler: passing 75 micron sieve)

Sub-Clause 505.3.3 Insert the following paragraph between the existing paragraphs 3 & 4:

“Mixed design shall be carried out in accordance with the modified Marshal method described in Asphalt Institute Manual MS-2.”

Sub-Clause 505.4.9 Rolling

Add at the end of Para 1

“The rolling shall be continued till the density achieved is at least 98% of that of laboratory Marshall Specimen compacted as detailed in Table 500-11.”

Add the following Sub-clause after Sub-clause 505.4.9

Clause 507 BITUMINOUS CONCRETE

Sub-Clause 507.1 Scope

Add the Following at the end of this clause:

“A site trial shall be performed in accordance with the direction of the Engineer”

Sub-Clause 507.2.1 Bitumen

This Clause shall be read as under:

The bitumen use for the work shall be VG-30 grade conforming to IS:73:-2006.

Sub-Clause 507.2.2 Coarse Aggregates

Add the following as second para:

“The constituents of the aggregates shall be produced by integrated crushing and screening plant (Impact or Cone type of capacity 200T/hour) and, unless otherwise instructed by the Engineer, crushing shall be carried out in at least two stages. The fraction of material passing through 4.75mm sieve shall also be crusher run screening only.”

From the Table 500 – 16, replace at bottom of the table against Asterisk (*) with the following:

“Aggregate should satisfy both the tests Los Angeles abrasion value and aggregate impact value”

Sub-Clause 507.2.4 Filler

This clause shall read as under:

“Filler shall consist of finely divided hydrated lime or cement as approved by the Engineer.”

Sub-Clause 507.3 Mixture Design

Sub-Clause 507.3.1 Requirement for the mixture

Add the following requirements to the list of Table 500-11:

Water sensitivity (ASTM D1075): Retained stability (Ratio of Marshal Stability for 24 h Immersion and 30min Immersion in water at 60 degree centigrade temperature) = not less than 75 %

Swell Test (Asphalt Institute, MS-2, No.2), maximum = 1.5%

Sub-Clause 507.4.9 Add the following additional sub-clause 507.4.9

The bitumen concrete layer shall be laid with sensor paver capable of paving in width 8 to 10 m in single operation.

Sub-Clause 507.9 Rate

Delete the existing Para and replace it with the following:

The contract unit rate shall be for all operations as specified in clause 505.9, except that the rate shall include the provision of modified bitumen at 5.40 percent by weight of total mixture. The variance in actual percentage of modified bitumen used will be assessed and payment adjusted up or down, accordingly. The modified

binder, the cost of modifier and its mixing with the bitumen for the preparation of modified bitumen shall not be paid separately and is inclusive of all costs

CLAUSE 516 MASTIC ASPHALT

Sub-Clause 516.2.2 Coarse Aggregate

Delete "Crushed gravel/Shingle or other stones" from the 1st sentence

SECTION 800 TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES

CLAUSE 801 TRAFFIC SIGNS

Sub-Clause 801.2.5 Substrate

2nd sentence of this clause shall read as under:

"The aluminum sheet used for signs shall be 2mm thick."

Sub- Clause 801.3 Traffic Signs Having Retro-reflective Sheeting

Sub-Clause 801.3.1 General Requirements

The fifth sentence of this clause should read as under:

"The reflective sheeting shall be of High Intensity grade with encapsulated lens."

Sub-clause Add following in the clause

801.3.8.3 "All the facility information and place identification signs shall have blue (Indian standard colour No. 166: French Blue) background and white letters."

Sub-Clause Warranty and Durability

801.3.11 the first and second sentences of this clause shall read as under:

"The Contractor shall obtain from the manufacturer a seven-year warranty for satisfactory field performance including stipulated retro-reflectance of the retro-reflective sheeting of high intensity grade and submit the same to the Engineer. In addition, a seven year warranty for satisfactory in-field performance of the finished sign with retro-reflective sheeting of high intensity grade, inclusive of the screen printed or cut-out letters/legends and their bonding to the retro-reflective sheeting shall be obtained from the Contractor/Supplier and passed on to the Engineer."

Sub-clause 801.4.1 the last sentence of clause shall read as follows

Posts shall be embedded in concrete (M-15) for safeguard against theft. The cost of concrete shall be deemed to be included in the rate of signboard.

Sub-clause 801.4.2 Add following at the end of this clause:

"The sign back shall be painted with two coats of grey colour epoxy paint. The sign post shall be painted in black & white alternate bands with two coats of epoxy paint."

CLAUSE 802 OVERHEAD SIGNS

Sub-Clause 802.4 Materials for Overhead Sign and Support Structures

Sub-Clause 802.4.2

The last line of this clause “they shall _____ IS specifications” shall read as

“They shall be thoroughly descaled, cleaned, primed along with all other components of signs, except reflective portion. They shall be painted with two coats of epoxy paint. The sign back side shall be painted with grey colour and post shall be painted in black & white alternate bands. The post below ground shall be painted with three coats of red lead paint”.

Sub-Clause 802.4.3 Replace “1.5mm” with 2.0mm” in the fifth line.

Sub-Clause 802.8.1 this clause shall read as under:

“The Structural steel part of the overhead signs shall be measured in tones while the sign board shall be measured in square meters. The excavation for foundation, concrete and reinforcement in foundation shall be paid separately under the respective BOQ items. All other items like painting of structural steel and sign back etc. shall be considered incidental and no separate payment shall be made. The contract unit rate for overhead sign structures shall be payment in full compensation for finishing, all labour, materials, tools, Equipment, fabrication, installation and all other incidental works necessary to complete the work to the specifications”

CLAUSE 803 ROAD MARKINGS

Sub-Clause 803.2 Materials

This clause shall read as under:

“Road markings shall be hot applied thermoplastic compound and the materials shall meet the requirements as specified in Clause 803.4.

The road markings shall be laid in one layer with appropriate road marking machine approved by the Engineer. Before the road-marking machine is used on the permanent works, the satisfactory working of the machine shall be demonstrated on a suitable site, which is not part of the permanent works. The rate of application shall be checked and adjusted as necessary before application on a large scale is commenced, and thereafter daily.”

Sub-Clause 803.3 Ordinary Road Marking Paint

This Clause shall be deleted.

Sub-Clause 803.5 Reflectorised Paint

This Clause shall be deleted.

803.6.6 Add the following para at the end of Sub-Clause 803.6.6

Line and curves, whether broken or unbroken, shall not consist of chords but shall follow the correct radius.

ii) Faulty Workmanship or Materials

If any materials not complying with the requirements is delivered at the Site or used in the Works, or if any sub-standard work is carried out, such material or work shall be removed, replaced or repaired as required by the Engineer, at the Contractor's own cost. Rejected traffic markings and paint that has been splashed or has dripped onto the surfacing, kerbs, structures or other such surfaces shall be removed by the Contractor at his own cost, in such a way that the markings of spilt paint will not show up again later."

CLAUSE 805 DISTANCE INDICATOR POSTS

Sub-Clause 805.3 The first sentence of this clause shall read as under:

"The hectometre/kilometre stones shall be made of concrete of grade as shown in the drawing."

Sub-Clause 804.3.1 New Clause 804.3 shall be added as follows:

Marker post shall be provided as shown in drawing. The posts shall be embedded in the ground as shown in drawing.

Sub-Clause 804.4 Measurement of Payment

The measurement will be in numbers of 200 meters, kilometers, 5th kilometer stone and marker posts fixed at site.

Sub-Clause 804.5 Rate

The words '/marker posts' shall be inserted after the words '5th kilometer stone' appearing in the clause.

CLAUSE 806 ROAD DELINATORS

Sub-Clause 806.2 This clause shall read as follows:

- a) Triangular Object Marker shall be 300mm side with four red reflector, made out of 2mm thick aluminum sheet, face to be fully covered by high intensity grade white retro reflective sheeting of encapsulated lens type as per clause 801. The background/ border/ symbols shall be made by screen-printing of desired colour as per sign details. The sign plate shall be fixed with 6mm dia. aluminium rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 40mmx40mmx5mm. The sign shall be fixed with nut-bolts & welding on MS pipe 50mm dia (NB-MW) and 500mm high or as shown in the drawings.
- b) Rectangular hazard marker 600mm x 300mm made out of 2mm thick aluminum sheet, face to be fully covered by high intensity grade white retro reflective sheeting of encapsulated lens type. The background/ border/ symbols shall be

made by screen-printing of desired colour as per sign details. The sign plate shall be fixed with 6mm dia aluminium rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 40mmx40mmx5mm. The sign shall be fixed to 80mm dia (NB-MW) MS pipe or as shown in the drawings.

- c) Roadway Indicators shall be 1000mm high made with 100 mm dia. NB medium weight MS pipe. One reflector of high intensity grade retro reflective sheeting with encapsulated lens shall be provided on top of the reflector. The white & red reflector shall be provided alternatively of 40mm width, so that total width of reflector shall be 120mm. A wire mesh cover of 150mm height shall be provided on top or as shown in the drawings.
- d) All components of signs & supports shall be thoroughly descaled, cleaned, primed and painted with two coats of epoxy paint. The sign backside shall be with grey colour and post shall be white colour/ alternate white & black bands. The post below ground shall be painted with three coats of red lead.

CLAUSE 807 BOUNDARY STONES

Sub-Clause 807.1 Scope

Add at the end of Para 1, "The boundary stones shall be of concrete as shown in drawing." The words 'RCD' should be engraved on each stones appropriately.

CLAUSE 811.2 CONCRETE CRASH BARRIER

Sub-Clause 811.2.1.2 *The Clause will be read as below*

"The concrete barriers shall be constructed with grade & concrete as indicated in the drawing and with high yield strength deformed reinforcement conforming to IRC-21"

Sub-Clause 809.6 Rate:

Add at the end of the clause:

"And paid as per respective BOQ items."

CLAUSE 811.3 METAL BEAM CRASH BARRIER

Sub-Clause 811.3.1 Materials

Sub-Clause 811.3.1.1 *this clause shall be read as:*

Metal beam is a "W" profiled corrugated beam in single or double row and single or double faced as specified in the drawing made out of cold roll forming from steel strip of 3 mm thick using steel of grade ST 42 grade conforming to IS:5986 with hot dip galvanised 550 gm per square meter.

The beam after forming shall have formed width of 312 mm and depth of 83 mm and shall have punched holes for fixing as specified in drawings.

The metal crash barrier posts & spacer shall consist 'C' channel section made out of 5 mm thick sheet by cold roll forming process of steel conforming to IS: 2062-1992 Grade 'A' with hot dip galvanised 550 gm per square meter. All bolt, nuts and washers as specified in drawings shall conform to IS: 1367 & IS: 1364 unless otherwise specified and are hot dip galvanized 550 gm per square meter.

The Guard rail reflector shall be made of material and placed in position as shown in drawings. It shall be hot dip galvanized 550 gm per square meter.

Beams to be erected on a radius of 50 m or less shall be shop curved to the appropriate curvature of the installation.

Sub-Clause Add at the end of this Clause

811.3.1.4 The size of the concrete foundation block for embeddings the guard posts and grade of concrete shall be as shown in the drawing.

Sub-Clause 811.3.3 Installation of Posts

The sub-clause 811.3.3.1, 811.3.3.2, 811.3.3.3 and 811.3.3.4 are replaced as below:

The guard posts shall be embedded in the concrete footing of size and the grade of concrete along with the depth of the embedment of post as indicated in the drawing.

Clause 811.3.3.5 Add "and end section" in first line after "posts".

Sub-Clause 811.3.7 Measurements for Payment

Sub-Clause 811.3.7.1 the 2nd sentence "Terminals/ Anchors of various types shall be paid by numbers" is deleted.

Sub-Clause 811.3.7.2 the first sentence will be substituted as below:

"No separate measurement for payment shall be made for Terminals/Anchors of various types required for the work. The cost of these elements will be deemed to be included in the rate quoted by the contractor."

Sub-Clause 811.3.7.3 the words "or backfilling" shall be substituted as "and concreting"

Sub-Clause 811.3.8 Rate

Add "and drawings" at the end of last sentence of Clause.

SECTION 900 QUALITY CONTROL FOR ROAD WORKS

Clause 901 GENERAL

Sub-Clause 901.1 This clause shall read as under:

"All materials to be used, all methods adopted and all works performed shall be strictly in accordance with the requirements of these Specifications. The Contractor shall set up a field laboratory at locations approved by the Engineer and equip the same with adequate equipment and personnel in order to carry out all required tests and Quality Control work as per Specifications and/or as per Clause 121 and/or as directed by the Engineer. The list of laboratory equipment and the facilities to be provided shall be as per Clause 121 and shall be got approved from the Engineer in advance."

Sub-Clause 901.5 This Clause shall read as under:

"The Contractor shall provide necessary cooperation and assistance in obtaining the samples for tests and carrying out the field tests as required by the 'Engineer' from

time to time. This shall include provision of laboratory, equipment, transport, consumables, personnel, including labour, attendants, assistance in packing and dispatching and any other assistance considered necessary in connection with the tests.”

Clause 903 QUALITY CONTROL TESTS DURING CONSTRUCTION

Sub-Clause 903.4 Tests on Bituminous Constructions

Sub-Clause 903.4.1 Add at the end of this Clause:

“The density test shall be carried out by 100 mm diameter core cutter machine on Dense Bituminous Macadam and Bituminous Concrete as per the frequency specified”.

In Table 900-4, Serial No. 5 for Dense Graded Bituminous Macadam /Bituminous Concrete, modify the ‘Frequency (Minimum)’ values for Item No. (vi), (viii) and (xvi) as under:

S. No.	Type of Construction	Test	Frequency (Minimum)
5	Dense Bituminous Macadam/ Bituminous Concrete	(vi) Sand Equivalent Test	Three tests on aggregates for each 400 t of mix subject to two tests per plant per day.
	Dense Bituminous Macadam/ Bituminous Concrete	(viii) Polished Stone Value (PSV)	Initially one set of three representative specimens for each source of supply. Subsequently when warranted by changes in the quality of aggregates.
	Dense Bituminous Macadam/ Bituminous Concrete	(xvi) Density of Compacted Layer	One tests per 250 m ² area subject to the condition that 10% of density tests shall be done on the edges.

Note:

Add the following note at the end

- The laboratory and field tests shall be performed on materials and works at the frequency values indicated against each. The Supervision Personnel shall ensure that there are no deviations in this regard.
- The Contractor shall prepare a detailed manual for Quality Assurance including

the methodology for the respective tests, the data formats and the methodology for the analysis and interpretation of test results based on the reference Standards and Practices indicated in the Technical Specifications and obtain the approval of the Engineer.

Add the following Sub-Clause 903.4.4 & 903.4.5

Sub-Clause 903.4.4 Characteristics to be tested on completed Bituminous Layers

The characteristics to be tested on completed bituminous layers are:

Relative compaction

Layer thickness

For testing the above characteristics, the following sampling criteria shall apply:

a) Random Sampling

When testing any lot, or an isolated section, which is obviously defective or exhibits abnormal variation of the characteristics under consideration, all samples shall be taken in a random pattern.

b) Lot Size

The lot size shall normally be a section laid and compacted in one process and for which essentially the same materials had been used. Where production is on a continuous basis, a lot shall normally mean one-day production and shall not exceed two full days production. However, the Engineer for investigating compliance with the specifications may order a lot of any smaller size, if:

- The factors affecting the characteristics under investigation exhibit abnormal variation within the normal lot size
- The area is obviously defective or of poorer quality than that of the rest;
- The rate of production is very high.

Sub-Clause 903.4.5 Add new clause

“Bituminous mix shall be spread with paver fitted with electronic sensing device and string line arrangement (supported by steel pegs @ 5m apart) on either side of paving width for automatic levelling, surface evenness and profile control. Use of string line is compulsory to provide signal to the electronic sensing device fitted with a Paver Finisher”.

Bituminous works shall be tested immediately after laying/finishing for:

- a) Thickness (compacted) measured by extracting cores and shall be dealt in accordance with Specifications Section 900.
- b) Density (compaction) test as performed on the extracted cores
- c) Workmanship test by measuring roughness of the finished layer by duly

calibrated Towed Fifth Wheel Bump Integrator

d) **Workmanship Test: Roughness measured longitudinally**

The finished bituminous layers (DBM and BC) shall be tested for workmanship (immediately before allowing traffic) by measuring roughness, longitudinally, separately for each lane with the Calibrated Towed Fifth Wheel Bump Integrator. Calibration of Bump Integrator device shall be carried out using the procedure recommended in the World Bank Technical Publication No. 46. The measured roughness shall **not** exceed a value of 2000 mm/km for finished DBM and BC layers.

Note: Contractor shall arrange the core extraction machine at his cost and shall take cores of the executed bituminous works jointly with Engineer without any extra cost.

Sub-Clause 903.5 Quality Control Tests for Road Constructions

Sub-Clause 903.5.2 Pavement Concrete

Sub-Clause 903.5.2.1 Sampling and testing of beam and cube specimens

Replace first para ("At leastfor compliance.") with:

"One each day's work, at least six pairs of beams for flexural strength and six pairs of cubes for compressive strength shall be cast of concrete delivered to the paving plant as long as the total daily production is less than 300m³. For daily productions over 300m³, two additional beams and two additional cubes shall be cast of each 100m³, (or part thereof). Each pair of beams and cubes shall be from different deliveries of concrete. All specimens shall be transported in an approved manner to prevent any damage to the specimen. From each pair of beams and cubes one specimen shall be tested at 7 days and one at 28 days. The groups of beams specimens from each day's production tested at 28 days shall be used for assessing the strength for compliance with the strength requirements. The groups of beam specimens from each day's production tested at 7 days shall be used for early indication of the 28 days strength as described in Clause 603.3.3.2. The flexural strength test results shall prevail over compressive strength tests results for compliance."

Sub-Clause 903.5.2.2 Replace 1st para with following:

"Where the 28 days strength requirements are not met; or where in the opinion of the Engineer the quality of the concrete or its compaction is suspect, the actual strength of the concrete in the slab shall be ascertained by carrying out tests on six cores cut from the concrete at such locations. The cores shall be 150 mm diameter, shall be saw cut in both ends to provide a specimen height of 300 mm ± 5mm and shall be tested for compressive strength. The concrete will be acceptable if:

- The average compressive strength of the six cores when corrected to 28 days strength using the factors given in Table 900-5 or an age-strength relationship for the actual mix determined by the Contractor and approved by the Engineer

– is at least the average compressive strength of the cores tested from the trial length, refer Clause 602.10.5.5;

- None of the cores show considerable honeycombing”.

Delete fourth para (“In order..... test beams.”).

Delete fifth para (“The standard deviation.....the requirements.”)

Delete sixth para (“An individual.....is substandard.”)

Add at the end of seventh paragraph (“Beams shall..... and cubes required.”)

“The Engineer may permit a reduction in the number of beams and cubes required when previous test results have shown satisfactory strength and when he is satisfied with the variation in quality of the mix.”

Delete ninth para (“The flexural.....they were taken.”).

Delete eleventh para (“Should the concrete.....flexural strength.”)

Delete twelfth para (“The equivalent ----- obtained from Table 900-5.”)

Sub-Clause

903.5.2.2 In-situ density

Add as Para 5 of this clause:

“This Clause is not applicable for cement concrete kerb and kerb with channel”.

Sub-Clause

903.5.2.5 Summary of Control Tests.

In Table 900-6, item 5 (i) “Strength of concrete”, change test frequency to:

“On each day’s work, at least six pairs of beams and six pairs of cubes for total daily production less than 300 m³. Two additional beams and two additional cubes for each 100 m³ (or part thereof) in excess of 300m³.”

Sub-Clause

903.5.2.5 Summary of Control Tests in Table 900-6, item 5(ii) “(core strength on hardened concrete”, change test frequency to:

“As per Clause 903.5.2.1”.

Sub-Clause 903.5.2.6 Add the following new Clause:

Temperature Measurements

“The temperature development in the concrete slab during hardening shall be recorded for each day’s production. The temperature shall be measured in the middle (vertically) of the slab at a horizontal distance of at least 1000 mm from any free edge. The temperature shall be measured using a thermometer that shows maximum temperatures. From each day’s production three thermometers

shall be installed, at commencement, in the middle of production and at completion of placing concrete. Measurements shall be recorded for 3 days after placing of the concrete.”

SECTION 1000 MATERIALS FOR STRUCTURES

CLAUSE 1007 COARSE AGGREGATES

Delete “crushed gravel, natural gravel or a suitable combination thereof or other approved inert material” in the third and fourth line of first para and replace with “or crushed boulders. For this purpose, boulder greater than average dimension of 300 mm shall only be used”

Add the following at the end of Para 2.

“Costs of all tests shall be borne by the Contractor.”

Add the following at the end of the Clause:

"Integrated stone crusher with Primary and Secondary (Cone or Impact Type) crushers shall be employed for getting proper size and grading of coarse aggregates."

The alkali aggregate reactivity should be measured and reported for getting approval for the source aggregates at the beginning of the work using methods given in IS: 2386. The tests may be repeated if the source or the type of rock being exploited for winning aggregates, changes.

CLAUSE 1008 SAND/FINE AGGREGATES

Delete from the 2nd line the word “crushed gravel” and from the 3th line “gravel” in Para 2.

Add the following at the end of the clause:

“The alkali aggregate reactivity shall be measured and reported for getting approval for the source.”

Clause 1010 WATER

In Para (C) the permissible limit for Chlorides (Cl) shall be read as "250 mg/lit for structures having length more than or equal to 30 m."

In case of structures of lengths 30m and below, the permissible limits of chlorides may be increased up to 500mg/ltr.

Clause 1012 CONCRETE ADMIXTURES

Sub-Clause 1012.1 General

Add the following at the end

Admixtures shall not impair the durability of concrete; they shall not combine with the ingredients to form harmful compounds or endanger the protection

reinforcement against corrosion. Only chloride free admixtures shall be used.

2. Storing

- A. Shelf life
- B. Max. & Min. allowable temperature
- C. Other instructions (e.g. requirements of stirring)

3. Dosage

Maximum and minimum to be specified as a percentage of weight of cement.

Clause 1012.3.1 Information Required From the Manufacturer

Paragraph 1 shall read as follows:

For all admixtures being used the packing shall be marked with the name of the supplier/manufacturer, brand name (name of product) and main effect. A certificate for the admixture in question shall be submitted. The certificate shall include the following information:

Add the following at the end of the para h

- i. pH value and colour.
- j. If two or more admixtures have to be used in one mix, their compatibility.
- k. Latest date of test and name of test laboratory.

Add the following at the end of the clause:

After selecting a few acceptable brands and types of admixture based on the manufacturer's data/technical literature, independent acceptance tests should be carried out for the same using the approved combination of cement/sand/aggregates intended for use in the project. After establishing the basic acceptability using strength criteria (compression and tensile strengths) a number of trial mixes be designed using different proportions of admixtures/cement/water etc. to establish the data bank on the behavior of the admixture for the project site conditions. A spectroscopic signature of accepted product should be obtained and preserved for comparison for acceptance of the production lots.

Retrial should be conducted with change in source/type of cement.

Workmanship

The dosage should be finalized on the basis of field trial and special mechanical devices should be used for dispensing the admixture in the batching/mixing plant. No addition of admixture after dosage is permitted (including addition in transit mixers).

Manufacturer's experts should be available for consultation/trouble-shooting of problems associated with their product. The conditions of storage, shelf life etc., as

specified by the manufacturer should be strictly observed. The manufacturer's Quality Assurance Plan during process of production should be obtained and filed for reference/record.

Clause 1014 STORAGE OF MATERIALS

Sub-Clause 1014.3 Aggregates

The following shall be added to this Clause:

"Aggregates shall be stored or stockpiled in such a manner that segregation of fine and coarse sizes will be avoided and also that the various sizes will not become intermixed before proportioning. They shall be stored, stockpiled and handled in such a manner that will prevent contamination by foreign materials."

CLAUSE 1015 TESTS AND STANDARDS OF ACCEPTANCE

Add the following as Para 3:

"Independent testing of pre-stressing steel shall be carried out by the Contractor for each consignment from each source at site in the laboratory approved by the Engineer before use. The tests shall be carried out for the properties as listed in clause 7.2.1 of BS- 5896:1980. These tests are in addition to the tests carried out by the Manufacturer."

CLAUSE 1104 MATERIALS

Sub-Clause 1104.2 The first sentence of this clause is amended as follows:

Concrete to be used in Cast-in-situ piles shall be of grade as per BOQ or as directed by the Engineer.

SECTION 1500 FORMWORK

CLAUSE 1501 DESCRIPTION

The Clause shall read as below.

The Contractor shall prepare a formwork mobilization and utilization plan and submit the plan for Engineer's approval at least 28 days before the commencement of construction of structures. The requirement of formwork shall be worked out considering the overall construction program of all the structures to be cast in one or more stages, as specified in the drawings. The plan shall take into account the time required for erection of formwork, retention in position, stripping, and removal and subsequent use in the next and subsequent structures.

Notwithstanding Engineer's approval of mobilization plan, if due to any reason, Contractor has to arrange additional formwork, to meet the requirements of the construction program, it shall be done by the Contractor without any extra cost to the Employer.

CLAUSE 1502 MATERIALS

This Clause shall read as under:

"All materials shall comply with the requirements of IRC-87.

Material and components used for formwork shall be examined for damage or excessive deterioration before use/reuse and shall be used only if found suitable after necessary repairs.

Only steel formwork shall be used. The steel used for forms shall be of such thickness that the forms remain true to shape. All bolts should be countersunk. The use of approved internal steel ties or plastic spacers shall be permitted. Structural steel tubes used as support for forms shall have a minimum wall thickness of 4 mm."

Clause 1503 DESIGN OF FORMWORK

Sub-Clause 1503.1 *Add at the end of this Sub-clause*

"For distribution of load and load transfer to the ground through staging, an appropriately designed base plate must be provided which shall rest on firm sub-strata".

Sub-Clause 1503.2 The following shall be added at the end of this Clause:

"The work of formwork shall not commence without approval of the Engineer"

CLAUSE 1504 WORKMANSHIP

Sub-Clause 1504.1 *Add the following at the end of Clause 1504.1*

"The loading from the formwork shall be distributed to the soil or the permanent works below (e.g. pile cap) in such a manner that any total or differential settlement is within acceptable limits. Subsoil characteristics shall be taken into account while designing the staging to avoid untoward failures. All the pipes etc. used for staging shall be free from kinks, bends etc."

CLAUSE 1506 PRECAUTIONS

Add the following as items of this clause:

Adequate support against sideway and lateral loads due to construction operations and wind shall be provided.

In case cantilevers are supported directly from the ground, the supports for cantilevers shall be removed simultaneously with main supports only after approval for the same from the Engineer.

Forms shall be rigid and of adequate section to reduce deflections. Forms shall have sufficient rigidity to resist horizontal pressures caused by flowing concrete resulting from use of superplasticisers. The formwork shall resist the lateral pressure caused due to fast rate of placement by concrete pumps.

CLAUSE 1507 PREPARATION OF FORMWORK BEFORE CONCRETING

Add at the end of last para :

“Concreting shall not commence without approval of the Engineer”

CLAUSE 1508 REMOVAL OF FORMWORK

Add the following as para 7 Clause. 1508.

For prestressed units, the side forms shall be released, as early as possible and the soffit forms shall permit without restraint deformation of the member, when prestress is applied. Form supports and forms for cast in situ members shall not be removed until sufficient prestress has been applied to carry the dead load and any formwork supported by the member and anticipated construction loads.

Clause 1509RE-USE OF FORMWORK

This Clause shall read as under:

"After forms are stripped, all materials shall be examined for any damage and damaged pieces, if any, shall be removed either as rejected or for rectification if possible. The materials found fit to be reused shall be thoroughly cleaned. Holes bored through sheathing for form ties shall be plugged by driving in common corks or foamed plastics. Patching plaster may also be used to fill small holes. After cleaning and before re-fixing, each formwork shall be got approved from the Engineer.

Formwork and staging shall be so used as to ensure quality of the exposed surface. However, if in the opinion of the Engineer, any particular panel/member has become unsatisfactory for use at any stage, the same will be rejected and removed from site.

All bent steel props shall be straightened before reuse. The maximum deviation from straightness shall not exceed 1/600 of length. However the maximum number of users shall be limited to 20 times since only steel formwork is to be used .The maximum permissible axial loads in used props shall be suitably reduced depending upon their condition.”

CLAUSE 1510 SPECIALISED FORMWORK

Replace the words ‘slip-form work’ by ‘climbing formwork’ in the first sentence of this clause.

The first sentence of Para 2 of this clause shall read as follows:

Slip forming is not permitted.

Replace the word “plywood” by “marine plywood” in the fifth paragraph of this clause.

Clause 1513 RATE

Add the following at the end of the first para:

“The unit rate shall also include all costs for preparation of erection scheme, designs of false work and formwork and their approval.”

SECTION 1600 STEEL REINFORCEMENT (UN-TENSIONED)

CLAUSE 1602 GENERAL

Paragraph 2 of Clause 1602 shall read as follows:

“Reinforcements shall be thermo mechanically treated (TMT) deformed bars of grade Fe 415/ Fe 500 conforming to IS: 1786 as Specified in the drawings. Only uncoated steel shall be used as reinforcement unless specified.”

CLAUSE 1604 BENDING OF REINFORCEMENT

Para 1 shall be read as follows:

The reinforcement shown on the drawings shall be considered merely symbolic representations of the shape and position and shall not be used by the Contractors to justify any deviation from the stipulated requirements. Bar bending schedules and any supplementary drawings as may be required shall be furnished by the Contractor and got approved by the Engineer before start of work. The bending schedules shall state the number, shape and length of bar and weight in respect of each type. System of bar referencing should be coherent and systematic. A separate bar bending schedule shall be prepared for auxiliary bars like spacers, chairs etc.

CLAUSE 1605 PLACING OF REINFORCEMENT

Paragraph (c) (i) of Clause 1605 shall be read as follows:

Cover blocks shall be made of concrete or cement mortar with the same durability properties as the surrounding concrete and with the same type of constituents. In visible surfaces, the cover blocks shall be of the same colour and texture as the surrounding concrete. The Contractor’s proposal for cover blocks shall be submitted to the Engineer for acceptance.

Add the following as sub Para (f) to this Clause:

Tolerances:

1. Tolerance of cover: Deviation shall not exceed + 10 mm No negative tolerance is allowed.
2. Tolerance in position: Tolerance for deviation from the positions shown in the drawings shall not exceed the following:

Structural depth d (mm)	Tolerance (mm)
d < 1000	<10
1000 < d < 2000	< 0.01d
2000 < d	< 20

CLAUSE 1606 BAR SPLICES

Sub-Clause 1606.1 First sentence of Clause 1606.1 shall read as follows:

To the extent possible, all reinforcement shall be furnished in full lengths as indicated in drawings.

Add the following as paragraph 2 of Clause 1606.1:

The location of joints in continuous reinforcing bars, not shown in drawings, shall be submitted to the Engineer for acceptance. If nothing contrary has been specified, the number of bars to be joined in any cross-section shall not exceed one-third of the total.

Sub-Clause 1606.2 Welding

Sub-Clause Add the following at the end of the paragraph:

1606.2.1 "In prestressed concrete members, when welding of untensioned reinforcement is permitted by the Engineer, it shall be carried out before insertion of the prestressing tendons/sheathing."

SECTION 1700 STRUCTURAL CONCRETE

CLAUSE 1703 GRADES OF CONCRETE

Sub-Clause 1703.2 This Sub-Clause shall be replaced with the following:

"The lowest grades of concrete in bridges and corresponding minimum cement contents and water-cement ratios shall be maintained as indicated in Table 1700-2 and 1700-3."

TABLE 1700-2 for all major bridges (bridges with total length 60m and above, ROBs, Flyovers, Grade Separators) and minor bridges (bridges with total length less than 60 m & Underpasses)

A) Minimum cement content and maximum water cement ratio

Structural Member	Min. cement content (kg/cum)		Max. water cement ratio	
	Major Bridges	Minor Bridges	Major Bridges	Minor Bridges
PCC Members	360	310	0.45	0.45
RCC Members	400	400	0.40	0.40
PSC Members	400	400	0.40	0.40

B) Minimum strength of concrete

Member	Major Bridges	Minor Bridges
PCC Members	M30	M20

RCC Members	M35	M25
PSC Members	M40	-

TABLE 1700-3 For culverts and other incidental structures:

A) Minimum cement content and maximum water cement ratio

Structural Member	Min. cement content (kg/cum)	Max. water cement ratio
PCC Members	310	0.45
RCC Members	400	0.40

B) Minimum strength of concrete

Member	Grade
PCC Members	M20
RCC Members	M25

Notes:

1. The minimum cement content is based on 20mm aggregate (nominal max. size). For 40mm and larger size aggregates, it may be reduced suitably but the reduction shall not be more than 10 per cent.
2. For under water concreting, the cement shall be increased by 10 per cent.

The cement content shall be as low as possible but not less than the quantities specified above. In no case shall it exceed 540 kg /cum.

Clause 1704 PROPORTIONING OF CONCRETE

Add the following at the end of this Clause:

“In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the manufacturer’s weight per bag, a reasonable number of bags shall be weighed separately to check the net weight. Where cement is weighed from bulk stock at site and not by bag, it shall be weighed separately from the aggregates. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked.

It is most important to keep the specified water-cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined as frequently as possible; frequency for a given job being determined by the Engineer according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. The determination of moisture content in the aggregates shall be done as per IS: 2386 (Part III). Suitable adjustments shall also be made in the weight of aggregates to allow for the variation in weight of aggregates due to variation in their moisture content.”

Sub-Clause 1704.4 Additional Requirements

In Para (a) substitute "0.06%" for "0.1%"; "0.06%" for "0.2%"; and "0.1%" for "0.3% for the three items respectively.

Clause 1705 ADMIXTURES

This Clause shall read as under:

"Duly tested admixtures/additives conforming to IS: 6925 and IS: 9103 (without replacement of cement) may be used subject to satisfactory proven use, with the approval of the Engineer. Admixtures generating Hydrogen or Nitrogen and containing chlorides, nitrates, sulphides, sulphates and any other material liable to affect the steel or concrete shall not be permitted.

The general requirements, physical and chemical requirements shall be as per Clause 1012."

Clause 1706 SIZE OF COARSE AGGREGATE

Table 1700-7 shall be modified as given below :

Components	Maximum nominal size of Coarse aggregate (mm)
a) RCC Well Curb.	20
b) RCC / PCC well steining, PCC below foundations and approach slab, annular filling around foundations.	40
c) Well cap or pile cap; solid wall type abutments, piers, median walls, splayed wing walls and their foundations.	40
d) RCC works in T-beam and slab / solid slab / voided slab and box girder superstructure, wearing coat, kerb, crash barrier, approach slab, dirt walls, coping on masonry wing walls, hollow abutments and piers, pier / abutment caps, pedestals, dirt walls, piles, all components of counter fort type abutments, columns, cantilever return walls etc.	20
e) All PSC works	As specified by the Engineer
f) Any other item	

Clause 1707 EQUIPMENT

Para 1 of this Clause shall read as under:

"Unless specified otherwise, equipment for production, transportation and

compaction of concrete shall be as under:

- a) For production of concrete: Batching and mixing of the concrete shall be done in a concrete batching and mixing plant fully automatic of a minimum capacity of 30 cum/hour. The plant shall be approved by the Engineer.
- b) In special cases for culverts, the Engineer may allow mixing of concrete by a diesel or electrically operated mechanical mixer with integrated weigh batching facility having a capacity of 500 litres and automatic water measuring system.

Paragraph 3 of this clause shall read as follows:

“The accuracy of measuring devices shall fall within the following limits:

Measurement of Cement \pm 1% of the quantity of cement in each batch.

Measurement of Water \pm 1% of the quantity of water in each batch.

Measurement of Aggregate \pm 2% of the quantity of Aggregate in each batch.

Measurement of Admixture \pm 1% of the quantity of Admixture in each batch.

Paragraph 3(b) & 3(c) shall remain unchanged.

CLAUSE 1711 CONCRETING IN EXTREME WEATHER

Sub -Clause 1711.2 Hot Weather Conditions

Add the following at the end of paragraph 1 of the above clause:

Where the Contractor proposes to use ice to cool the concrete or mixing water or any of the ingredients, the Contractor shall provide a refrigeration plant to avoid use of contaminated ice.

Placement of concrete shall not be permitted when day temperature exceeds 40°C.

Clause 1712 PROTECTION AND CURING

Sub-Clause 1712.2 Water Curing

Add the following at the end of Para 1:

Water sprinklers or perforated pipes shall be used for curing of concrete for all major bridges, ROB's and grade separators. Such arrangement must be in place & tested before concreting for its proper functioning and shall be maintained for a minimum period of 14 days after concreting.

Approved concrete curing compounds should be preferred where water curing cannot be done reliably.

CLAUSE 1716 TOLERANCES

Add the following at the end of Clause:

“In the absence of any information in drawings or specifications, for particular cases, the following limitations shall apply.

Dimension (mm) ‘a’	Tolerances (mm) ‘ $\delta_a = (a_{\text{nominal}} - a_{\text{actual}})$ ’
$a \leq 200$	$|\delta_a| < 5$
$200 < a \leq 2000$	$|\delta_a| < 3.5 + 0.0075a$
$2000 < a$	$|\delta_a| < 16.5 + 0.001a$

CLAUSE 1718 MEASUREMENT FOR PAYMENT

The clause may be read as under :

Structural concrete shall be measured in cubic metres. In reinforced or prestressed concrete, the volume occupied by reinforcement or prestressing cables and sheathing shall not be deducted. The slab shall be measured as running continuously through and the beam as the portion below the slab. In the case of RCC/PSC voided slab the deduction shall be made for the volume of void.

SECTION 1800 PRE-STRESSING

CLAUSE 1801 GENERAL

Add the following as the last paragraph of this clause:

Prestressing system shall conform to FIP Recommendation "Recommendations of acceptance of post-tensioning systems", June 1993.

CLAUSE 1802 MATERIALS

Sub-Clause 1802.2 Sheathing

Sub-Clause 1802.2.1 The second and third sentences of Para 6 shall be read as follows:

“The joint between the end of coupler and the duct shall be sealed with heat shrink tape to prevent penetration of slurry during concreting. The couplers of adjacent ducts should be staggered at least 300mm apart.”

Add the following at the end of Para 6:

Couplers and splices shall be larger in diameter than ducts joined.

Sub-Clause 1802.2.3 This clause may be read as under:

Pull-in or push-in of prestressing stands shall be mechanized.

Strands shall not be placed in the ducts before concreting. The ducts shall be sealed at the ends by plastic caps to prevent water from entering.

Cables shall be threaded after concreting. In such cases a temporary tendon shall be inserted in the sheathing, or the sheathing shall be stiff ended by other suitable method during concreting. The sheathing supports shall be such as to prevent

floatation of empty cable duct during concreting.

Add the following as additional Sub-clause

Sub-Clause 1802.2.4 Corrugated HDPE sheathing ducts

When high-density polyethylene (HDPE) sheathing ducts are specified, the material for the ducts shall be with more than 2 percent carbon black to provide resistance to ultraviolet degradation and shall have the following properties:

Specific Density	:	0.954 g/cm ³ at 23 °C
Yield Stress	:	18.0 N/mm ²
Tensile Strength	:	21.0 N/mm ²
Shore Hardness D-3 sec. Value	:	60
-15 sec. Value	:	58
Notch impact strength at 23 °C	:	10 KJ/m ²
- 40 °C	:	4 KJ/m ²
Coefficient of Thermal Expansion for		
20 °C - 80 °C	:	1.50 x 10 ⁻⁴ KJ/m ²

The thickness of the wall shall be 2.3 ± 0.3 mm as manufactured and 1.5 mm after loss in the compression test, for duct size upto 160 mm OD.

The ducts shall be corrugated on both sides. The ducts shall transmit full tendon strength from the tendon to the surrounding concrete over a length not greater than 40 duct diameters.

These ducts shall be joined by adopting any one or more of the following methods, as convenient to suit the individual requirements of the location, subject to the satisfactory pressure tests, before adoption.

Screwed together with male and female threads.

Joining with thick walled HDPE shrink couplers with glue. This can also be used for connection with trumpet, etc.

Welding with electro fusion couplers. The joints shall be able to withstand an internal pressure of 0.5 bar for 5 minutes as per test procedure given in Appendix-1A of IRC: 18 - 2000.

Sub-Clause 1802.3 Anchorages

Heading of the clause shall be "Anchorages and Tendon couplers"

Sub-Clause 1802.3.1 The word “Anchorages” shall be replaced by the words “Anchorages and couplers” in sentence 1 of the paragraph.

Add the following after the words “furnished to the Engineer” in sentence 3 of paragraph 1 of this clause:

“Couplers which connect two tendons to form a continuous tendon, should be tested in the same way as anchorages formed by mechanical means.”

CLAUSE 1803 TESTING OF PRESTRESSING STEEL AND ANCHORAGE

Add following Paragraphs to the section.

All samples shall be representative of the lot and in the case of wire or strand shall be taken from the same master roll. At least 5.0m length shall be selected from each lot for testing. Also two anchorage assemblies, complete with distribution plates of each size or types to be used, shall be tested. Testing of anchorage - cable assemblies shall be carried out in accordance with procedures in FIP document "Recommendations for the acceptance of Post Tensioning systems", June 1993.

The frequency of such tests should be as follows:

- 1) For acceptance of the tendon at the stage of submission of tendons, the manufacturers certificate together with the data of previously conducted and most recent test results of "Acceptance Testing" is acceptable subject to further testing as given below.
- 2) Acceptance Testing for the works
 - a) Static load test for tendon-anchorage assembly

A series of three tests using the proposed combination of anchorage systems and the prestressing strand/wire/bars. All the tests should meet the following requirements.

Residual deformations of anchorage components after the test should confirm the reliability of the anchorage.

The increase in the displacements between the anchorage components as well as between the prestressing steel and anchorage components should not be disproportionate to the increase in tendon force.

The above relative displacements during the 0.8Fpk load stage should stabilize within the first thirty minutes of the load duration of 1 hour.

The mode of failure of tendon should be by the fracture of the prestressing steel. Failure of the tendon should not be induced by the failure of anchorage components.

The measured anchorage efficiency should be:

(Refer CEB/FIP Guidelines for details).

The total elongation ϵ_u in free length of the tendon under the load F_{tu} should be $\epsilon_u \geq 2\%$

b) Dynamic load test with tendon/ anchorage assembly

This test is to be carried out for every new combination of type of anchorage and tendons. A series of three successful tests shall be carried out for acceptance of the systems. This test is considered as essential for both unbonded and bonded cables as per FIP document.

Requirements:

Each test result should meet the following requirements

- Fatigue failure of anchorage components should not occur.
- The minimum fatigue strength of post-tensioning system should be $\Delta\sigma_p \text{ min} = 80 \text{ MPa}$
- The fatigue strength is defined as the stress range ($\Delta\sigma_p$), which is endured for 2 million cycles without failure of more than 5% of the initial cross-section of the tested tendon at beginning of the test.

Clause 1804 WORKMAN SHIP

Sub-Clause 1804.3.1 Post-tensioning

The following para shall be inserted between the 5th and 6th para.

“The steel sheaths or duct formers shall be suitably tied to secondary reinforcement or to properly locate withdrawable through-shutter bolts, precast concrete blocks or similar effective means, in such a manner that they do not give rise to excessive friction when the steel is being tensioned.”

Sub-Clause 1804.5 Insert following Para after Para 1

Mixture of water-soluble oil such as Dromas - B and Water is to be flushed through empty metallic ducts before threading of cables, and after threading of cable at frequency of at least once in a month. The layer of oil formed on sheathing / prestressing steel shall be fully flushed out by using clean water before final grouting by cement grout.

CLAUSE 1806 TENSIONING EQUIPMENT

Add the following at the end of Para 2:

“Jack and Pump shall be calibrated by an approved laboratory prior to use and then at intervals not exceeding three months.

A standby set of jack, pumps and pressure gauges shall always be available at site where prestressing is in progress.”

Add the following at the end:

"Before initial use & subsequently at suitable intervals the pre-stressing equipment shall be checked to determine any variation from the normal values during use.

SO far as these variations depend upon external influence (e.g. temperature in the case of oil jacks) they shall be taken into account"

CLAUSE 1807 POST TENSIONING

Add the following at the end of Para 5 of this clause:

"Parallel measurement by load cell in combination with direct reading of Pressure gauge shall be preferred. In any case such parallel measurements by load cell shall be made for at least 10% of the cables stressed during any tensioning operation."

Add the following at the end of this Clause:

"The Contractor shall submit fabrication drawings, detailing prestressing cables, anchorages, couplers, chairs and supports, templates or forms holding anchorage assemblies etc. for Engineer's approval at least one month before commencement of work in superstructure. Stressing schedules shall be prepared by the Contractor and submitted to Engineer for approval."

CLAUSE 1808 GROUTING OF PRE-STRESSED TENDONS

Add new Para at the end of Clause as under:

"Where directed by the Engineer the Contractor shall perform full-scale site test to determine the adequacy of grout mix, equipment and grouting method. The Contractor shall submit a method statement detailing the test procedure.

Special Attention is directed to Appendix 1800 / III of the Standard Specifications. Contractor shall arrange for testing of all grout components and of the mix, prior to the start of grouting and whenever the source of any component is changed, to ensure that the grout is free of anything that could promote shrinkage or cracking of the grout or corrosion in the tendons. Further samples of grout and its components shall be obtained for each day of grouting at each site where grouting is carried out and a full chemical analysis shall be performed on the samples."

CLAUSE 1815 RATE

Add at end of Para 4:

Cost of fixing anchorages / sheathing for dummy cables and future prestressing cables shall be incidental to work and shall not be measured / paid extra. No additional cost shall be payable for stressing of cables for compensation of short fall of prestress or for any other reason.

CLAUSE 1816 JOINTS IN CONSTRUCTION WITH PRE-CAST-UNIT

Add new clause:

“Joints between a series of precast concrete units which are to be prestressed together by post-tensioning shall be such as to ensure even transfer of compression from one unit to another.

Whatever be the method of jointing, the holes of the prestressing steel shall be accurately made and shall meet one another in true alignment at ends. Jigs shall always be used. Care shall be taken to ensure that the jointing material does not enter the duct or press the sheath against the prestressing steel.

Jointing by application of mortar on the face of a unit and then placing another unit against it shall not be permitted.

Suitability and effectiveness of the method should be got confirmed from a suitably designed mock-up.”

SECTION 2000 BEARINGS

CLAUSE 2001 DESCRIPTION

Add the following as paragraph 2 of this clause:

“Within 90 days of award, the Contractor shall submit detailed specifications, designs and drawings including installation drawings and maintenance manual, for the approval of the Engineer. Designs shall also include review and modifications of designs and drawings of bearing pedestals and other elements required for installation. The installation of bearings shall be carried out under the supervision of the manufacturer of the bearings. The Contractor shall provide the bearings only from the manufacturers approved and enlisted by the Department. In addition to routine testing of the materials and bearings at manufactures premises, the Contractor shall arrange at his own cost testing of random samples of 1 % (Minimum 1 no. of each type) of bearings from independent agencies, other than manufactures’ own facilities, duly approved by the Engineer. The bearings shall be selected by the Engineer / his authorised representative and duly sealed in his presence for dispatch to the independent agency.”

CLAUSE 2004 SPECIAL BEARINGS

The clause shall read as follows:

Sub-Clause 2004.1 Spherical Bearings: Spherical Bearings shall conform to the requirements of sections 9.1 and 9.2 of BS 5400. However materials of bearing elements may conform to Indian Standards nearest to the specifications stated in the above sections of BS: 5400.

Clause 2005 ELASTOMERIC BEARINGS

Sub-Clause 2005.4 Acceptance Specifications

In Para 5, substitute the words "Engineer or his authorised representative" for the word "Inspector".

Sub-Clause 2005.3.5 Inspection Certificate

Substitute the words "Engineer or his authorised representative" for the word "Inspector".

Sub-Clause 2005.4.6 Quality Control Certificate

Delete the words "/Inspector" in the third paragraph.

CLAUSE 2006 POT BEARINGS

The clause shall read follows:

"Pot Bearings shall conform to the requirements of IRC: 83 (Part III)-2002. Mild steel to be used for components of the bearings shall comply with Grade B of IS: 2062."

Sub-Clause 2006.1 General

Sub-Clause 2006.1.2 Add after 2nd sentence "Provisions of IRC83 (Part III) shall be applicable for POT, POT cum PTFE, PIN and Metallic Guide Bearings"

ADD new Clause 2009 as under and the existing Clauses 2009 and 2010 are renumbered as 2010 and 2011 respectively :

CLAUSE 2009 "Tar Paper bearing shall be reinforced bitumen laminated Kraft paper conforming to IS-1398".

Clause 2010 MEASUREMENTS FOR PAYMENT

Add the following after Para 2:

"Tar Paper bearings shall be measured in square meters."

SECTION 2100 OPEN FOUNDATIONS

CLAUSE 2106 TOLERANCES

Reference to Tolerance shall be made to Clause 1716.

SECTION 2200 SUB-STRUCTURE

CLAUSE 2204 PIERS AND ABUTMENTS

Sub-Clause 2204.2 replaced as follows:

"Slip forming will not be allowed."

Add new Sub-Clause 2204.7 at the end of clause:

"Wherever necessary, suitable cofferdams or other means shall be provided to exclude water from the construction area. The Contractor shall provide necessary pumping equipment for dewatering areas. No payment will be made for these

operations as per Clause 304.5.1.”

Sub-Clause 2210 Rate

This Clause shall read as follows:

“The contract unit rate for masonry, concrete and reinforcement in substructure shall include all works as given in respective sections and cover the cost of incidental items like providing cofferdams, dewatering, providing special formwork, where necessary, and all other items for furnishing and providing substructure as mentioned in this section.”

The necessary material (thermocole, bituminous fibrous board or equivalent material) and labour, tools etc. required for maintaining 20 / 40 mm gap between faces of various structures (old / new) wherever required / as shown in drawing shall be incidental to work and shall not be measured / paid separately.

SECTION 2300 CONCRETE SUPER-STRUCTURE

Clause 2305 PRESTRESSED CONCRETE CONSTRUCTION

Sub-Clause 2305.2 Box Girder

Add the following at the end of paragraph 1:

“Contractor shall, in his methods statement, indicate the location of construction joints for Engineer’s approval.”

Add new sub clause 2305.5 as under:

Sub-Clause 2305.5 PSC Solid Slab

Casting of the slab shall be done in a single stage without construction joints.

The portions of deck near expansion joints shall be cast along with Reinforcements and embedments for expansion joints.

The deck slab shall be finished rough, but true to lines and levels as shown in drawings. Bearings shall be set as shown in drawings.

Sub-Clause 2504.2.2 Filter Media

Add after 1st Para:

“The material for filter media behind abutment shall conform to general guide lines given in Appendix 6 of IRC-78 (Standard Specification and Code of Practice for Road Bridges – Section-II).”

Clause 2507 CURTAIN WALL AND FLEXIBLE APRON

Replace Sub-clause 2507.1 and modify sub-clause 2507.2 as under:

Sub-Clause 2507.1 Curtain Wall

The rigid flooring shall be enclosed by curtain walls (tied to the wing walls) with a minimum depth below floor level on up-stream side and downstream side as indicated in the drawings. The curtain wall shall be in cement concrete M-20

grade. The rigid flooring shall be continued over the top width of the curtain wall.

Sub-Clause 2507.2 Flexible Apron

First sentence under this sub-clause shall read as under:

“Flexible apron of thickness indicated in the drawing, comprising loose stone boulder (weighing not less than 40 kg) shall be provided beyond curtain wall for a minimum distance of 3.0 m on upstream side and 6.0 m on downstream side”

Sub-Clause 2509 Add new Para in the end of the Clause;

“Filter media and cement concrete bedding, wherever required, shall be measured in cubic metre and paid separately as per contract.”

SECTION 2600 EXPANSION JOINTS

Clause 2602 GENERAL

Add the following at the end of the clause.

“The expansion joints shall be procured only from those manufacturers/ suppliers of expansion joints who are empanelled with MOSRT&H. The MOSRT&H (formerly, Ministry of Surface Transport) had issued modified interim specifications for expansion joints vide letter dated 31/03/97 and revised vide letter No. RW/NH-34059/1/96 - S&R dated 30th Nov, 2000 and corrigendum of same circular dated 15th Jan., 2001 which shall be adopted. These specifications are reproduced below.”

TABLE R-1 SUITABILITY CRITERIA FOR ADOPTION OF DIFFERENT TYPES OF EXPANSION JOINTS

Sl. No.	Type of Expansion	Suitability of Adoption Joint	for	Expected Service Life	Special Consideration
1.	Buried Joint	Simply supported spans upto 10 metres		10 Years	Only for deck with bituminous/ asphaltic wearing coat. Steel plate may need replacement, if found corroded or distorted at the time of relaying/ renewal of wearing coat.
2.	Filler Joint	Fixed end of simply supported spans with insignificant movement or simply supported spans not exceeding 10 metres.		10 Years	The sealant and joint filler would need replacement if found damaged.

3.	Asphaltic Plug Joint	Simply supported spans for right or skew (upto 20 degree), moderately curved or wide deck with maximum horizontal movement not exceeding 25 mm. Ambient temperature should be in the range of 5 degree to 50 degree Celsius.	10 Years	Only for decks with bituminous/ asphaltic wearing coat. Not suitable for bridge with longitudinal gradient more than 2 % and cross camber/ super-elevation exceeding 3%. Not suitable for curved spans and spans resting on yielding supports.
4.	Compression Seal Joint* (Chloroprene Seal & Cell Foam Seal)	Simply supported or continuous spans right or skew (upto 30 degree), moderately curved with maximum horizontal movement not exceeding 40 mm.	10 Years	Chloroprene/ Closed Foam Seal may need replacement during service.
5.	Elastomeric Slab Seal Joint*	Simply supported or continuous spans, Right or skew (less than 20 degree), moderately curved with maximum horizontal movement upto 50 mm	10 Years	Liable to excessive wear and tear under high traffic intensity. Not suitable for bridges located in heavy rainfall area and spans resting on yielding support.
6.	Single strip seal joint*	Moderate to large simply supported, cantilever/ continuous construction having right, skew or curved deck with maximum horizontal movement up to 70 mm	25 Years	Electrometric seal may need replacement during service.
7.	Modular Strip/ Box Seal Joint	Large to very large continuous/ cantilever construction with right, skew or curved deck having maximum horizontal movement in excess of 70 mm	25 Years	Electrometric seal may need replacement during service.
8.	Special Joints for	For bridges having wide decks and large	25 Years	Electrometric seal may need replacement

special span length involving during service.
conditions complex movements/ Provision of these
rotations in different joints may be made
directions/ planes, with prior approval of
provision of special the Ministry.
type of modular
expansion joints such
as Swivel joists joints
may be made.

* These are proprietary items for which 10 years warranty shall be insisted upon from the suppliers. The contractor shall submit all relevant information as per clause 115.1

Clause 2608 Add the following Sub-Clause after the end of This Clause

Sub-Clause 2608.3 Installation

- (a) The Expansion joint shall be installed by the manufacturer/ Supplier.
- (b) The block out for the joint shall be marked and constructed to the dimensions as indicated in the drawing or recommended by the manufacturer/ supplier.
- (c) The recess for the block out shall thoroughly cleaned of any loose or foreign material wire brushing and air blowing and dried with hot compressed air.
- (d) The recess in the deck slab, if required, shall be repaired with epoxy mortar and cleaned and dried again.
- (e) The foam caulking/backing rod shall be placed about 25 mm down in the joint opening.
- (f) The aggregate shall be washed, cleaned and heated to a temperature between 170°-180°C prior to placement.
- (g) The binder shall be preheated to temperature of 170 – 190° C before application.
- (h) While sealing the joint opening with preheated binder, care shall be taken that the binder does not spill on to the joint surface of the deck.
- (i) The joint shall not be installed when the ambient temperature goes below + 5 deg. C or above + 35 deg.C. or while it is raining/ snowing. (Planning for installation must taken into account the weather condition).
- (j) When clement weather resumes, the joint installation may be continued after the upper layer and/or exposed surface of the partially completed joint has been re-prepared by heating and/ or coating with binder as

necessary.

Sub-Clause 2608.4 Handling and Storage

All the aggregates and binder shall be pre-bagged and clearly marked. All the material shall; be stored on concrete platform at 150 mm above the ground in covered enclosures to avoid contamination.

Clause 2608.5 Tests and Standard of Acceptance

The material shall be tested in accordance with these specifications and shall meet prescribed criteria. The manufacture/ supplier shall furnish the requisite certificates from the recognized testing laboratory of India or abroad.

The work shall conform to these specifications and shall meet the prescribed standards of acceptance.

The clause 2609 be replaced fully as below:

Clause 2609 COMPRESSION SEAL JOINT

Clause 2609.1 Compression seal joint seal joint shall consist of steel armoured nosing at two edges of the joint gap suitably anchored to the deck concrete and a performed chloprene elastomer or closed cell foam joint sealer compressed and fixed in to the joint gap with special adhesive binder.

Clause 2609.2 Material

(a) Steel nosing

The steel nosing shall be of angle section ISA 100 x 100 conforming to weldable structural steel as per IS:2062. The thickness of legs shall not be less than 12 mm. The top face of the angle shall be provided with Bleeder holes of 12 mm diameter spaced at a maximum 100 mm centers so as to ensure that there are no voids in the concrete beneath the angle.

(b) Anchorage

The anchorage steel shall conform to IS:2062 or equivalent. The steel nosing shall be anchored to the deck by reinforcing bars, headed studs or bolts or anchor plates cast in concrete or a combination of anchor plate and reinforcing bars, headed studs or bolts. Anchor bars, studs or bolts shall engage the main structural reinforcement of the deck and in case of anchor plates o anchor loops this shall be achieved by passing transverse bars through the loops or plates.

The minimum thickness of anchor plate shall be 12 mm. Total cross sectional area of bars, studs or bolts on each side of the joint shall not be less than 1600 mm sq. per metre length of the joint and the center

to center spacing shall not exceed 250 mm. The ultimate resistance of anchorages shall not be less than 600 KN/m in any direction.

(c) Corrosion Protection

All steel section shall be protected against corrosion by hot dip galvanizing or any other approved anticorrosive coating with a minimum thickness of 100 micron.

(d) Joint Seal

i) The sealing element shall be a performed continuous chloroprene or closed cell foam seal with high tear strength, insensitive to soil, gasoline and ozone. It shall have high resistance to aging and ensure water tightness. The seal should be vulcanised in a single operation for the full length of the joint required for carriageway, kerbs and footpaths, if any. The seal shall cater for a horizontal movement upto 40 mm and vertical movement of 3 mm.

ii) The physical properties of chloroprene/ closed cell foam sealing element shall conform to the following:

Chloroprene Seal

Shall be performed extruded multi web cellular section of chloroprene of such a shape as to promote self-removal of foreign material during normal service operations. Chloroprene of joint seal shall conform to clause 915.1 of IRC:83 (Part – II) and satisfy the properties stipulated in Table – 2 Strip Seal Element Specification of these specifications except in respect of the working movement range of the sealing element which shall be as specified in Clause 2.4.1 above.

Closed Cell Foam Seal

Shall be of performed non extruded non cellular section made from low density closed cell, crossed linked ethylene vinyl acetate, polyethylene copolymer that is physically brown using nitrogen. The material shall possess properties as indicated in **Table. 1**:

Table – 1

Property	Specified Value
i) Density	41.7 – 51.3 Kg/ cum
ii) Compression Set on 25 mm	50 percent compression samples (ASTM D3575) for 22 hours at 23 degree Celcius, 2 hour recovery; 13 percent set.
iii) Working temperature	-70 to +70 deg C.

iv)	Water absorption (total immersion for 3 months) (ASTM D3575)	0.09766 Kg/ sqm
v)	Tensile strength	0.8 Mpa
vi)	Elongation at break (ASTM D3575)	195 +/-20 percent

(e) Lubricant cum Adhesive

The type and application of material used in bonding the performed joint seal to the steel nosing and concrete shall be as recommended by the manufacturer / supplier of the seal system.

Sub-Clause 2609.3 Handling and Storage

- (a) The expansion joint material shall be handled with care and stored under cover. All joint material and assemblies shall be protected from damage and assemblies shall be supported to maintain true shape and alignment during transportation and storage.

Sub-Clause 2609.4 Installation

- (a) The expansion joint shall be installed by the manufacturer/ supplier or their authorized representative, who will ensure compliance of installation procedure and instructions.
- (b) The dimension of the joint recess and the width of the gap shall conform to the approved drawings.
- (c) Anchoring steel shall be welded to the main reinforcement in the deck maintaining the level and alignment of the joint.
- (d) Concreting of pocket/ recess shall be done with great care using proper mix conforming to same grade as that of the deck concrete but not less than M30 grade in any case. The water cement ratio shall not be more than 0.40. If needed, suitable admixtures may be used to achieve the workability. The width of pocket shall not be less than 300 mm on either side of the joint. Care shall also be taken to ensure efficient bonding between already cast/ existing deck concrete and the concrete in the joint recess.
- (e) At the time of installation, joint shall be clean and dry and free from spalls and irregularities, which might impair a proper joint seal.
- (f) Concrete or metal surfaces shall be clean, free of rust, laitance, oils, dirt, dust or other deleterious materials.
- (g) The lubricant cum Adhesive shall be applied to both faces of the joint and joint seal prior to installation in accordance with the manufacturer's instructions. The joint seal shall be compressed to the specified thickness.

for the rated joint opening and ambient temperature at the time of installation, which shall be between +5 to 35°C.

- (h) The joint seal shall be installed without damage to the seal. Loose fitting or open joints shall not be permitted.

Sub-Clause 2609.5 Acceptance Criteria

- (a) All steel elements shall be furnished with corrosion protection system.
- (b) For the joint seal the acceptance test shall conform to the requirements stipulated in Para above. The manufacturer/ supplier of this type of joint shall produce a test certificate to this effect conducted in a recognized laboratory in India or aboard.
- (c) Prior to acceptance 25 percent of the completed and installed joints, subject to a minimum of one joint, shall be subjected to water tightness test. Water shall be continuously ponded along the entire length for a minimum period of 4 hours for a depth of 25 mm above the highest point of deck. The width of ponding shall be at least 50 mm beyond the anchorage block of the joint on either side. The depth of water shall not fall below 25 mm anytime during the test. A close inspection of the underside of the joint shall not reveal any leakage.

CLAUSE 2613 TEST AND STANDARDS OF ACCEPTANCE

The clause 2613 be replaced fully as Below

“The materials shall be tested in accordance with these specifications and shall meet the prescribed criteria. The manufacturer / supplier shall furnish the requisite certificates from the recognized testing laboratory of India or abroad.

The work shall conform to these specifications and shall meet the prescribed standards of acceptance.”

CLAUSE 2614 Measurement for payment

The clause 2614 be replaced fully as below

The expansion joint shall be measured in running metres. For filled joints, the rate per running metre shall include the cost of sealant for the depth provided in this drawing. The expansion joint shall be measured along the width of the deck slab from one end to the other including length through footpaths and parapets.

CLAUSE 2615 RATE

The clause 2615 be replaced fully as below

The contract unit rate shall include the cost of all material, labour, equipment and other incidental charges for fixing the joints complete in all respects as per these specifications in the case of Bridge Contractor supplying the expansion joint. If the manufacturer supplies the expansion joint directly to the Engineer, the cost of installation, handling and fixing shall be borne by the Bridge Contractor.

SECTION 2700 WEARING COAT AND APPURTENANCES

CLAUSE 2702 WEARING COAT

Sub-Clause 2702.1 Bituminous Wearing Coat

"Asphaltic concrete wearing coat shall be constructed in thickness as shown in drawings"

CLAUSE 2703 RAILINGS AND CRASH BARRIER

Sub-Clause 2703.3 Cast-in-Situ Railings and parapets

Last sentence of paragraph 3 shall be replaced by the following.

"Location of construction joints shall be determined in advance and approved by Engineer."

Add the following additional clauses:

Sub-Clause 2703.5 Concrete crash barrier for bridges

Sub-Clause 2703.5.1 General

This work shall consist of construction, provision and installation of concrete crash barrier on the bridge deck / approach slab / approaches at locations and of dimensions as shown on the drawings or as directed by the Engineer.

Sub-Clause 2703.5.2 Materials

All materials shall conform to Section 1000-Materials for Structures as applicable, and relevant Clauses in Section 1600 shall govern the steel reinforcement. The concrete barriers shall be constructed either by the "cast-in-place with fixed forms" method or the "extrusion or slip form" method or a combination thereof at the Contractor's option with the approval of the Engineer. Where "extrusion or slip form" method is adopted, full details of the method and literature shall be furnished.

Grade of concrete for crash barrier shall be as per BOQ or as directed by Engineer.

An expansion joint with Polysulphide Joint sealants and bituminous fiberboard shall be provided in the crash barriers at the location of expansion joints/ gaps on the bridge, approaches etc.

Sub-Clause 2703.5.3 Construction Operations

The location of crash barrier shall be strictly adhered to as shown on the drawing and as directed by the Engineer. Concrete crash barriers shall present a smooth, uniform appearance in their final position, conforming to the horizontal and vertical lines shown on the plans or as ordered by the Engineer and shall be free of lumps, sags or other irregularities. The top and exposed faces of the barriers shall conform

to the specified tolerances, as defined in Clause 809.4, when tested with 3 m straight edge, laid on the surface.

The concrete crash barrier or precast shall be given two coats of cement paint or aqua based paint as directed by the Engineer of approved brand and shade.”

Sub-Clause 2703.5.4 Tolerance

The overall horizontal alignment of crash barrier and rails shall not depart from the road alignment by more than ± 30 mm, nor deviate in any two successive lengths from straight by more than 6 mm and the faces shall not vary more than 12 mm from the edge of a 3 m straight edge. Barriers shall be at the specified height as shown in the plans above the edge of the nearest adjacent carriageway or shoulder, within a tolerance of ± 30 mm.

Sub-Clause 2703.5.5 Measurements for Payment

All barriers will be measured in cubic metres of concrete completed for the barriers including approach and departure ends. The sealing of opening in crash barrier at expansion joints with polysulphide rubber joint sealant and bituminous fibreboard as per sub- clause 2703.6 shall be incidental to work. The reinforcement in barriers shall be measured and paid separately in relevant item of B.O.Q. The painting over crash barrier shall be measured in square meter and paid separately.

Sub-Clause 2703.5.6 Rate

The Contract unit rate shall include full compensation for furnishing all labour, materials, tools, equipment and incidental costs necessary for doing all the work involved in constructing the concrete barrier complete in place in all respects as per these Specifications.

Sub-Clause 2703.6 Polysulphide Rubber Joint Sealant

Polysulphide Joint sealants with bituminous fiberboard shall be provided in the Expansion Joints/ gaps in Crash Barriers.

Before application it shall be ensured that the top of the bituminous fiberboard and the concrete faces are dry, sound, free from dirt, grease and other loose foreign matter. A thin coat of primer shall be applied on concrete faces with a brush to air dry before applying sealant. The components of the sealant i.e. base and hardener shall be mixed in a slow speed mixed sealant till uniform color is obtained. Placement of the mechanical mixer shall be done with either cartridge or fully enclosed gun barrels within 30 minute of mixing. Manufacturer’s recommendation shall be followed.

The sealing compound shall be two packs, low modulus of elasticity Polysulphide elastomer having bituminous ingredients such as Cico T-680 or equivalent with following properties of the cured compound.

Tensile strength - 0.4 MPa \pm 10%

Modulus of elasticity - At 100% elongation: 0.15 MPa

Elongation	-	Elongation at break	550%
Hardness	-	Shore 'A' hardness @ 25°C	22 ± 3
Operating temperature	-		-20°C to + 80°C
Shrinkage	-		Less than 1%
Permanent dynamic	-		± 25%

Movement capability

Polysulphide material shall be approved by the Engineer prior to procurement.

Measurements for Payments

Cost for providing Polysulphide Joint sealants and bituminous fiberboard in the Expansion Joints in Crash Barriers shall be deemed to be included in the unit rate of Crash Barrier and shall not be measured separately.

Clause 2706 WEEP HOLE

This clause shall read as under:

"Weep holes shall be provided in solid plain concrete/reinforced concrete/brick masonry abutments, wing walls, return walls as shown in the drawing or as directed by the Engineer to drive moisture from the back filling. Weep holes shall be provided with 100 mm dia PVC pipe of approved thickness and shall extend through the full width of concrete with slope of about 1 vertical: 20 horizontal towards the draining face.

The spacing of weep holes shall generally be 1m in either direction or as shown in the drawing with the lowest at about 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer."

CLAUSE 2708 MEASUREMENTS FOR PAYMENT

Replace in Clause 2708- sub-clause ii, "running meters" by "running meters/ cubic meters as per unit provided in BOQ".

CLAUSE 2709 RATE

The second paragraph shall be read follows:

"The contract unit rate of parapets and railings shall include the cost of all labour, materials tools and plant required for completing the unit in accordance with specifications".

Add at the end of Para 2:

The contract unit rate for approach slab shall include cost of reinforcement and providing and laying in position bitumen joint filler with joint sealing compound in the 20 mm thick gap between dirt wall and approach slab.

CLAUSE 2819

PROVIDING AND FIXING DRAINAGE SPOUT INCLUDING SEALING WITH NON-SHRINK FREE FLOW CEMENT GROUT.

For all existing bridge decks where drainage spouts are to be replaced new drainage spouts shall be provided as shown in the drawings.

The waterproofing material shall be provided, around the area of drainage spout and spout pipe, from the top of the deck.

The work shall be executed in accordance with Specifications Section 2700 clause 2705 except to the extent modified below.

The work shall be carried out after the wearing coat around the spout is removed. The existing spouts shall be removed carefully with minimum damage to surrounding concrete. The pocket formed shall be sufficiently large to ensure good flow and compaction of non-shrink cement grout around the new spout. In case the earlier spouts were provided in railing kerb, holes shall be drilled in slab without excessively damaging surrounding concrete.

CLAUSE 2820

REPAIR TO LEACHED, HONEYCOMBED, SPALLED CONCRETE

Leached, honeycombed, spalled concrete (area of damage less than 0.5 m²) shall be repaired with average 50 mm average thick PMC mortar in two or more layers with a bond coat of PMC slurry between two successive layers.

All loose concrete shall be chipped off with a chipping machine so that loose layers of concrete are removed exposing the reinforcement. All loose concrete sticking with the reinforcement shall be removed. Where reinforcement bars are already exposed, the chipping shall continue so as to expose half the diameter, prior to further treatment. The concrete surface shall be thoroughly cleaned with wire brush and oil free air blast. Where the damaged areas are large, sand blasting should be done to clean the reinforcement and the surrounding concrete. If reinforcement is seen, the same shall also be cleaned thoroughly. The reinforcement shall be coated with PMC slurry within one hour of cleaning to prevent rusting. The PMC shall be brush applied on the cleaned reinforcement ensuring that full surface area is covered in accordance with the manufacturers' recommendation.

Before applying PMC repair mortar the prepared concrete substrata shall be thoroughly soaked with clean water. Free surface water shall be removed before priming. The substrata shall be primed with PMC slurry.

The specifications for polymer modified cementitious (PMC) mortar / debonding slurry are as under:

The anti-corrosive polymer latex, which is to be used should consist of water based QA-Acrylic polymer incorporated with non-alcoholic bipolar corrosion inhibitor. The polymer to be used shall be MONOBOND-2000 or equivalent. Colour: Milky white liquid.

Solid content: The polymer solid content shall be 36 ±1 percent. The particles shall be of nearly spherical shape with a diameter of 0.35±0.05 micron. The manufacturer shall certify the above requirements about solid content & grain size. In order to

keep control over the quality, the manufacturer shall provide infrared absorption spectrum analysis for the material to be supplied by them.

Mixing proportion: Anti-corrosive polymer modified mortar

- Cement - 100 parts by weight
- Monobond-2000 - 40 parts by weight
- Silica sand - 300 parts by weight

The sand, which is to be used for constituting the PMC repair mortar, should be silica sand as the basic material, which is categorized in two groups.

- a) Coarse Silica and
- b) Fine Silica

The grading of the above groups should follow the limits provide below.

Quartz sand.

I.S. Sieve No.	Percentage passing by weight
10 mm	100
4.75 mm	100
2.36 mm	100
1.18 mm	85 - 90
600 microns	45 - 55
300 microns	15 - 20
150 microns	5 - 10
75 microns	0 - 3

In the event of using local sand, the sand to be used must satisfy the limits of deleterious materials & the requirements of soundness as given in Cl 3.2.1 & Cl 3.6 respectively of IS: 383, confirmatory test shall be conducted by the contractor and sample kept for comparison by the Engineer.

Curing

Air-corrosive polymer modified mortar curing procedure outline apply to normal weather conditions. Under hot weather, take precautions to avoid drying. PMC work should be carried out at a temperature below 40° C.

Under unusual weather conditions e.g. high humidity and / or high wind velocity or imposed constraints special curing procedure shall be followed for which approval shall be obtained from the engineer.

Anti-drying shall be considered to be taken place only during favourable uninterrupted weather condition existing throughout the existing recommend drying period. Some judgments shall be made in this respect & if conditions are deemed unfavourable for drying to occur, then drying must be prolonged for the full recommend period after weather clears.

As PMC work proceeds, precautions shall be taken to prevent rapid drying of the PMC repair mortar. This is usually accomplished by covering the filled surfaces with an impermeable sheet shortly after the work has been done.

The sheet shall be kept in place until further work is carried out over the mortar or in case where the mortar is likely to be disturbed the sheet shall be kept in place for 24 hours.

No foot traffic for further work shall be allowed over mortar until 12 hours after the time of the completion of work.

Curing compound may also be used as curing membrane. Care shall be taken to ensure complete covering particularly around the interface with the host concrete.

For the first day the repaired concrete patch shall be protected from harsh environment by laying a polythene sheet over it, lapping down the edges.

Mixing PMC

Methods of Mortar mixing

To mix PMC, it is necessary to have the following items:

- A suitable sized non-ferrous mixing container preferably plastic.
- A high-speed drill with mixing paddles.
- Promark batching containers for measuring out components to be mixed.

Pour all the liquid polymers latex into mixing container. After shaking the latex to disperse the solid uniformly throughout the liquid before use, begin mechanical mixing & while doing so, slowly add the dry components, i.e. cement & sand.

Mix for about 5 minutes until solids have been well dispersed. The resulting mix should look uniform, feel creamy & be free from lumps & grits.

Precautions shall be taken not to entrap an excessive amount of air into the mix during mixing.

Since the desired consistency depends on type & brand of cement as well as weather conditions start a trial mix with a reduced amount of cement. Once all components are mixed, add cement if necessary to achieve the desired consistency. Record the amounts of cement required & use this for subsequent mixes. Do not reduce the quantity of cement noted in the Mix Proportions.

In case the slurry sets before application of mortar, a fresh coat of slurry shall be applied. Under no circumstances, water shall be added in PMC repairs mortar mix.

Unused mortar or mortar which has partially set shall not be re-mixed & used.

Mechanical Strength of Mortar

Anti-corrosive polymer modified mortar shall have the following:

	7 day	28 days
Compressive strength	18 N/MM ²	38 N/MM ²
Flexural strength (IS 5816 –1959)	-	10 N/MM ²
Split tensile strength (IS 5816 – 1959)	-	6 N/MM ²

For anti –corrosion polymer modified bonding slurry

The anti-corrosive polymer modified bonding slurry shall be QA Acrylic base MONOBOND 2000 or equivalent.

The bonding slurry should remain in tacky state prior to placing of the freshly mixed concrete or mortar.

Mixing proportions of Bonding Slurry are as follows:

Cement	-	100 parts by weight
MONOBOND 2000	-	40 parts by weight
Fine Silica sand	-	100 parts by weight

The fine silica sand, which is to be used for consistency in anti-corrosive polymer modified bonding slurry, should be with fine silica sand with following sieve sizes.

I.S. Sieve No.	Percentage passing by weight
10 mm	100
4.75 mm	100
2.36 mm	100
1.18 mm	100
600 microns	90-100
300 microns	40-60
150 microns	0-10
75 microns	0-3

Mechanical Strength of Bonding Slurry

Bond Strength –

- WET - 3-4 N/MM²
- DRY - 7-8 N/MM²

Above bonding slurry should conform to following properties.

- ASTM-C1059-86 (Latex agents for bonding fresh to old concrete)
- ASTM-C1042-86 (Bond strength of latex system with cement)
- Pot life: 1 hour for 5 kg bonding slurry mix.

CLAUSE 2821 REPAIR TO VOID IN ARCHES WITH PMC MORTAR

The voids created in the masonry arches by dislodged stones shall be filled with PMC mortar.

The surface shall be thoroughly cleaned with wire brush and oil free blast. Before applying PMC repairs, the prepared substrate shall be thoroughly soaked with clean water. Free surface water shall be removed before priming. The substrata shall be primed with PMC slurry. Repair mortar shall be applied before primer has set i.e. within 20-30 minutes. The mortar shall be applied with trowel and shall be well worked inside and compacted. The surface shall be smooth finished to match the adjacent surface. Unused mortar or mortar which has partially set shall not be used. Mortar shall be applied in layers to avoid sagging. Manufacturers' recommendation shall be followed. Specifications given in Clause 2818 shall be followed.

CLAUSE 2822 SEALING OF CRACKS IN CONCRETE IN PIER / ABUTMENT CAPS, SLABS, GIRDERS, PEDESTAL WALLS ETC. WITH EPOXY RESIN INJECTION.

The work is to seal all cracks in concrete in pier/abutment caps, slabs, girders, pedestal walls etc.

The work shall be executed in accordance with Specifications Section 2800 clauses 2803 & 2804.

The cracks shall be sealed with epoxy mortar prior to injection.

CLAUSE 2823 INSPECTION & CLEANING OF BRIDGE BEARINGS AND GREASING OF STEEL ROCKER-ROLLER / PLATE BEARINGS AND REMOVAL OF ALL DEBRIS AROUND BEARINGS.

The work shall consist of inspection of bearings to check whether the bearings are functioning properly and if any parts of the bearing or nuts and bolts are missing, to replace them. The work shall also include cleaning of bearings and oiling and greasing of metallic bearings, wherever required. Realignment/ readjustment of bearings, and replacement of missing parts of metallic bearings, requiring jacking up of superstructure is excluded from the scope of work. Replacement of existing bearings with new bearings is also excluded from the scope of the work.

The area around the bearings and their pedestals shall be cleared of all debris, vegetation, dust etc. and cleaned for proper inspection.

When grease boxes are fixed around the metallic bearings, (a) the same shall be permanently removed along with the old grease and (b) bearings shall be cleaned for proper inspection.

In case of elastomeric bearings, these shall be inspected for their proper seating, rotation, bulging, cracking, splitting etc. and a record thereof shall be provided to the Engineer for necessary instructions.

In respect of metallic bearings, fresh graphite grease as approved by the Engineer shall be applied to the surfaces, which are sliding, rotating or moving due to movement in bearings. The materials, specially, graphite grease, required for oiling and greasing of metallic bearings, wherever required, shall be as per approval of the Engineer. Grease used shall be such that it retains its properties for long life and shall not affect the bearing parts. All other surfaces of the metallic bearings shall be cleaned of all rusts, corrosion and a coat of anti-corrosive oil paint applied as per directions of the Engineer.

Missing parts of metallic bearings, nuts and bolts etc. shall be replaced by the contractor at no extra cost to the Employer.

CLAUSE 2824 CONTROLLED JACKING UP OF SUPER STRUCTURE FOR RESETTING/ REPLACEMENT OF ROCKER AND ROCKER CUM ROLLER BEARINGS, SEGMENTAL BEARINGS AND ELASTOMERIC BEARINGS

The work shall be executed before laying of new wearing coat and expansion joint. The superstructure shall be jacked up nominally at abutment end for resetting of the bearings. Jacking up of superstructure is a specialized work. Contractor shall furnish a methodology statement with his proposal for resetting/repair of bearings. Lifting shall be done through hydraulically operated jacks. The jacks shall be placed under cross diaphragm. Adequate distribution plates shall be placed at top and bottom of the jack to reduce the stress on concrete. If the soffit of the cross diaphragm is weak, the same shall be first repaired with epoxy mortar and / or epoxy injection and lifting will commence only after such repair work is fully cured. In addition to jacks, the span will also be supported on packing plates which shall be placed under the cross diaphragm between the jacks. The extent of lifting shall be decided by the Engineer.

Only proven type of jacks shall be used. These jacks shall be provided with lock nut system. The jacks shall be randomly tested for 1.5 times the capacity. In lifted condition the span will be supported on the lock nut arrangement of the jacks with no pressure on the hydraulic circuit. The contact stress on concrete shall not exceed 30 MPa. Suitable M.S. distribution plates have to be provided at top and bottom of the jack for this purpose. All jacks shall be connected to a common pump and it will be ensured that the deck is lifted equally upstream & downstream. For monitoring this, dial gauges shall be provided. Only steel packing plates shall be used. Specification for epoxy mortar / epoxy injection shall be followed for repair to soffit of cross diaphragm.

The cross diaphragms shall be closely watched during lifting and also for the entire duration when the span is supported on jacks and packing. If development of cracks is observed, the lifting will be stopped and alternate arrangement for supporting the superstructure shall be made subject to approval of Engineer.

The cost of all operations under this clause including all tools and plant, materials, jacks, pumps, labour etc. shall be incidental to cost of resetting / replacement of bearings.

CLAUSE 2825 APPLYING 1:3 CEMENT MORTAR TO EXPOSED SURFACE OF MASONRY OF EXISTING WING WALLS / RETURNS, ABUTMENT PIERS

All exposed masonry surface of existing wing walls / returns abutments, piers etc. shall be provided with 20 mm thick plaster where required. Walls / Returns and Retaining Wall at Sides of Approach Slabs with Brick Masonry shall be provided cement plaster in 1:3 cement mortar, 20 mm thick.

Existing wing walls and returns wherever deficient shall be built up and retaining walls shall be constructed at sides of the approach slabs as shown in the drawings.

The work shall be done in accordance with Specifications Section 1300. Masonry for construction of short retaining walls at sides of approach slab shall be laid over a 100 mm thick M 15 PCC levelling course.

CLAUSE 2826 BUILDING UP OF EXISTING WING WALLS/RETURNS AND RETAINING WALL AT SIDES OF APPROACH SLABS WITH BRICK MASONRY AND FINISHING WITH 1:3 CEMENT MORTAR 20mm THICK

Existing wing walls and returns wherever deficient shall be built up and retaining walls shall be constructed at sides of the approach slabs as shown in the drawings. The work shall be done in accordance with Specifications Section 1300. Masonry for construction of short retaining walls at sides of approach slab shall be laid over a 100 mm thick M 15 PCC leveling course.

CLAUSE 2827 SEALING OF WIDE GAPS AT JUNCTION OF WING WALL AND ABUTMENT WITH BRICK BATS AND FINISHING WITH 1:3 CEMENT MORTAR INCLUDING PROVIDING BITUMINOUS DEBONDING LAYER

Due to settlement of the wing wall a gap being created at the junction of the wing wall and the abutment, shall be sealed by filling with brickbats and finishing with plaster.

The abutment face of the gap shall be coated with one layer of bituminous compound. The gap shall be filled with bricks bats and rammed. The vertical exposed surface of the gap shall be plastered. Thereafter cement slurry shall be poured from the top under gravity till refusal. The top surface of the gap shall then be plastered and finally finished.

CLAUSE 2828 EARTH FILLING BELOW APPROACH SLAB

Cavities underneath the slab shall be filled.

The work shall be executed in accordance with Technical Specifications Section 300 clause 305. The cavities formed below the approach slabs shall be filled with approved back fill material. The filling shall be done in layers not exceeding 150mm. The masonry retaining wall shall also be built up in companion layers of 150mm. The compaction shall be done with the help of suitable equipment after necessary

watering.

CLAUSE 2829 CASTING OF APPROACH SLAB

The grade of concrete shall be as indicated in drawings/BOQ.

Approach slabs, which are cracked / missing or otherwise damaged shall be recast.

The work shall be executed in accordance with Specifications Section 2700 clause 2704. The approach slab shall be laid over lean concrete as per drawing. The base shall be consolidated to proctor density 98%.

CLAUSE 2830 STONE PITCHING ON SLOPES GROUTED WITH 1:3 CEMENT MORTAR

Slope protection with stone pitching shall be provided at abutments as indicated in drawing. The work shall be executed in accordance with Specifications, Section 2500.

CLAUSE 2831 PROVIDING AND PLACING IN POSITION MECHANICALLY FABRICATED GABION WALL AROUND ABUTMENT AND PIERS INCLUDING EXCAVATION AND BACK FILLING

The work shall be executed in accordance with Specifications Section 2500 clause 2503. Excavation and back filling shall be done in accordance with Specifications Section 300.

Gabions shall consist of a double twisted Zinc & PVC coated wire mesh container of variable sizes, uniformly partitioned into internal cells, interconnected with other similar units, and filled with stone at the site to form flexible permeable, monolithic structures. Mechanically fabricated double twisted hexagonal mesh type gabion such as Maccaferri or equivalent conforming to ASTM/ BS specifications shall be used.

Mechanically fabricated double twisted hexagonal mesh shall be approved by the Engineer prior to procurement and use.

CLAUSE 2832 the existing clause 2813 of the Specifications shall be renumbered as 2832

CLAUSE 2833 the existing clause 2814 of the Specifications shall be renumbered as 2833.

Add the following as items (h) to (w).

- h) Dismantling of kerbs, railings, parapets, footpaths, solid slab superstructure or part of slab and approach slabs, etc. RCC and masonry items shall be measured under separate heads.cum
- i) Steel handrail ..running metre
- j) Dismantling of existing damaged brick masonrycum
- k) Dismantling of course rubble masonry wings walls, piers, abutments and their foundationscum
- l) Provision of dowel barsNos

m)	Drainage spouts	....Nos
n)	Repairs to concrete with PMC mortar with average thickness of 50 mm of mortar applied.	....sqm
o)	Sealing of cracks in masonry by cement grouting (in terms of weight of cement consumption)	....kg
p)	Building up of existing course rubble masonry / concrete wing walls	....cum
q)	Repair of voids in arches	....cum
r)	Sealing of cracks in RCC abutments, piers, slabs, girders etc. by epoxy injection (In terms of weight of epoxy actually consumed for mortar and injection)	....kg
s)	Earth fill below approach slabs	....cum
t)	Concrete in approach slab	....cum
u)	Inspection, cleaning and greasing of bearings	....Nos
v)	Stone pitching	....cum
w)	Gabion Walls	....cum

Existing clause 2813 of specifications shall be renumbered as 2832.

CLAUSE 2834 RATE

Add the following at the end of the Clause.

- i) The contract unit rate for dismantling of existing railing / parapets shall include the cost of all materials, labour, tools and plants, disposal of dismantled materials, safety measures and all other incidental expenses necessary for the completion of work as per specifications.
- ii) The contract unit rate for dismantling of existing wing walls shall include the cost of all materials, labour, tools and plants, disposal of dismantled materials, safety measures and all other incidental expenses necessary for completion of work as per specifications.
- iii) The contract unit rate for providing dowel bars shall include the cost of all materials, labour, tools and plant, drilling of holes, placing dowel bar in position, grouting with non-shrink free flow cement, wastage, sampling, testing and all other incidental expenses necessary for completion of work excluding steel reinforcement as per specifications.
- iv) The contract unit rate for repair to leached, honeycombed, spalled concrete by PMC or guniting shall include the cost of all materials, labour, tools and plants, safety measures and all other incidental expenses necessary for completion of work as per specifications for the respective items.

- v) The contract unit rate of earth filling below approach slab shall include the cost of all materials, labour, tools and plants and all other incidental expenses necessary for completion of work as per specifications.
- vi) The contract unit rate for approach slabs shall include the cost of all materials, labour, tools and plants and all other incidental expenses necessary for completion of work as per specifications.
- vii) The contract unit rate for cleaning of bearing shall include the cost of all materials, labour, operations, tools and plants and all other incidental expenses necessary for completion of work as per specifications.
- viii) The contract unit rate for stone pitching shall include the cost of all materials, labour, tools and plants and all other incidental expenses necessary for completion of work as per specifications.

SECTION 3000 MAINTENANCE OF WORK

Clause 3002 RESTORATION OF RAIN CUTS

Clause 3002.1 Scope

The work shall consist of earthwork for restoration of rain cuts in the embankment and shoulders, using suitable material, and compacting the same.

Clause 3002.2 Materials

The materials used for restoration of rain cuts shall consist of soil conforming to clause 305.2.

Clause 3002.3 Construction Operation

The area affected by rain cuts shall be cleared of all loses soil and benched. The width of the benches shall be at list 300mm and they shall extend continuously for a sufficient length the height of the benches shall be in the range of 150-300mm.

Fresh material shall be deposited in layer not exceeding 250mm loose thickness and compacted so as to match with the benching at the moisture content close to the optimum. Compaction shall be carried out using suitable equipment such as plate compactors and rammers or by suitable implements handled manually.

Clause 3002.4 Measurement of Payment

The earthwork for restoration of rain cuts shall be measured in cubic meters.

Clause 3003 MAINTENANCE OF EARTHEN SHOULDER

Clause 3003.1 Scope

The work of maintenance of earth shoulder shall include making up the irregularities/loss of material on shoulder to the design level by adding fresh approved soil and compacting it with appropriate equipment or to strip excess soil from the shoulder surface as per the requirement of this Specification.

Clause 3003.2 Material

The material to be added to the shoulder, if required, shall be a select soil.

Clause 3003.4 Measurement of Payment

Maintenance of earthen shoulder shall be measured in sq. meters.

Clause 3004.2 Filling Pot-holes and Patch Repairs

Clause 3004.2.1 Scope

This work shall include repair of Pot-holes and patching of all types of bituminous pavement.

The work shall include the removal of all failed material, in the pavement courses and, if necessary, below the pavement, until the root cause of the failure is removed; the trimming of the completed excavation to provide firm vertical faces; The replacement of material of at least as high a standard as that which was originally specified for the pavement layer; the painting of tack coat on to the sides and bases of excavations prior of placing of any bituminous materials and the compaction, trimming and finishing of the surfaces of all patches to form a smooth continuous surfaces, level with the surrounding road.

Clause 3004.2.5 Measurement of Pavement

Filling of Pot-holes and patch repair shall be measured in sq. m.

ADDITIONAL TECHNICAL SPECIFICATION

Appendix A-1 :: SPECIFICATION FOR PASSENGER SHELTER

1. Scope

The work consists of providing passenger shelter including seating arrangement as per drawing.

2. Description

2.1 Passenger Shelter

It will be a permanent structure supported on R.C. columns at the corners and having sloped reinforced concrete slab with protrusions on all sides. Panel walls on three sides shall be built with brick jail of 125mm thick set in cement mortar 1:4 (1 part cement : 4 parts sand). It shall have seating arrangement with 100mm thick R.C. slab with raised back with atleast 1.5% reinforcement. The mix of concrete for seating slab and back shall be nominal one with 1:2:4 (1 part cement : 2 parts sand : 4 parts stone chips) and it will be finished with neat cement punning not less than 3mm thickness. The flooring shall be with 75mm thick B.F.S. flooring (1:2:4) over 100mm thick M-10 grade concrete. All walls, ceiling and roof top shall be finished with cement mortar (1:3). The exposed surfaces of the structure shall be painted with two coats of cement based paint of make and brand approved by the Engineer.

3.0 Measurement for Payment

The passenger shelter shall be measured in number of finished constructed structure.

4.0 Rate

The Contract unit rate shall be payment in full for construction of the passenger shelter. Raised footpath, ground preparation etc. shall be considered as incidental to work.

Appendix A-2:: PAINTING OF STRUCTURES WITH SYNTHETIC ENAMEL PAINT FOR NUMBERING & SPAN DETAILS OF BRIGES / CULVERTS AND WATER PROOF CEMENT PAINT FOR PARAPET, RAILING, KERB AND CRASH BARRIER

1. Painting with Synthetic Enamel Paint

Materials

Synthetic enamel paint confirming to IS : 2932 of approved brand and manufacture and of the required colour shall be used for the top coat and an undercoat of ordinary paint of shade to match the top coat as recommended by the same manufacturer as far as top coat shall be used.

Painting on New Surface

Preparation of surface.:

The surface shall be thoroughly cleaned and dusted off. All dirt, mortar droppings and grease shall be thoroughly removed before painting is started. The prepared surface shall have received the approval of the Engineer after inspection, before painting is commenced..

Application: The number of coats including the undercoat shall be as stipulated in the item.

- (a) **Under coat:** One coat of the specified ordinary paint of shade suited to the shade of the top coat, shall be applied and allowed to dry overnight. It shall be rubbed next day with the finest grade of wet abrasive paper to ensure a smooth and even surface, free from brush marks and all loose particles dusted off.
- (b) **Top Coat:** Two top coats of synthetic enamel paint of desired shade shall be applied after the undercoat is thoroughly dry. Additional finishing coats shall be applied if found necessary to ensure properly uniform glossy surface.

Lettering and Numbering on New Surface:

The letters and numbers for bridges/culverts span and number shall be as per IRC-7-1971. The size of area for painting shall be varied depend upon the numbers and letters. The background area and letters/numbers shall be painted with one prime coat (under coat) and two coats(top coat) of synthetic enamel paint.

Measurement for payment:

The painting of culverts /Bridges numbering and span arrangement shall be measured in number of each side facing traffic.

Rate:

Rate shall include the cost of materials, labour and other operation described above to complete set of letters and numbers required in each side facing traffic.

2. Water Proof Cement Painting

Material:

The water proof cement paint shall be (conforming to IS: 5410) of approved brand and manufacture.

The water cement paint shall be brought to the site of work by the contractor in its original container in sealed condition. The material shall be brought in at a time in adequate to suffice for the whole work or at least a fortnight's work, the material be kept in the joint custody of the Contractor and the Engineer-in-Charge. The empties shall not be removed from the site of work till the relevant item of the work has been completed and permission obtained from the Engineer-in-Charge.

Preparation of Surface:

For New work, the surface shall be thoroughly cleaned of all mortar dropping, dirt, dust, algae, grease and other foreign matter by brushing and washing. Pitting in plaster shall be made good and a coat of waterproof cement paint shall be applied over patches after wetting them thoroughly.

Preparation of mix:

Cement paint shall be mixed in such quantities as can be used up within an hour of its mixing as otherwise the mixture will set and thicken, affecting flow and finish, Cement paint shall be mixed with water in two stages. The first stage shall comprise of 2 parts of cement paint and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall be taken to add the cement paint gradually to the water and not vice versa. The second stage shall comprise of adding further one part of water to the mix and stirring thoroughly to obtain a liquid of workable and uniform consistency. In all cases the manufacturer's instructions shall be followed meticulously.

The lids of cement paint drums shall be kept tightly closed when not in use, as by exposure to atmosphere the cement paint rapidly becomes air set due to its hygroscopic qualities.

In case of cement paint brought in gunny bags, once the bag is opened, the contents should be consumed in full on the day of its opening. If the same is not likely to be consumed in full, the balance quantity should be transferred and preserved in an airtight container to avoid its exposure to atmosphere.

Application :

The solution shall be applied on the clean and wetted surface with brushes or spraying machine. The solution shall be kept well stirred during the period of application. It shall be applied on the surface which is on the shady side of the building so that the direct heat of the sun on the surface is avoided. The method of application of cement paint shall be as per manufacturer's specification. The completed surface shall be watered after the day's work.

The second coat shall be applied after the first coat has been set for at least 24 hours. Before

application of the second or subsequent coats, the surface of the previous coat shall not be wetted.

For the work, the surface shall be treated with three or more coat of waterproof cement paint as found necessary to get a uniform shade.

For old work, the treatment shall be with one or more coats as found necessary to get a uniform shade.

Precaution:

Water proof cement paint shall not be applied on surfaces already treated with white wash, colour wash, distemper dry or oil bound, varnishes, paints, etc. It shall not be applied on gypsums, wood and metal surfaces.

If water proof cement paint is required to be applied on existing surfaces previously treated with white wash, colour wash, etc., the surface shall be thoroughly cleaned by scrapping off all the white wash, colour was etc., completely. Thereafter, a coat of cement primer shall be applied followed by two or more coats of water proof cement paint.

Measurement for Payment:

The painting shall be measured in square metre of surface area treated.

Rate:

Rate shall include one prime coat and two coats of the paint over the prime coat including cost of all labour and materials involved in all operations described above.

Appendix A-3 :: SPECIFICATION FOR DISMANTLED MATERIAL REUSE IN GRANULAR SUB-BASE

1. Scope

The work consists of reusing the dismantled material in preparing granular sub-base.

2. Materials

The material used for work shall be collected from dismantled material of existing granular layer of road. The dismantled material shall be transported to batching plant to separate the materials of required grading. The finished granular material shall be mixed depending upon the required gradation. Use of materials like brick metal, kankar and crushed concrete shall be permitted in the lower sub-base. The reused material collected from dismantled material shall be free from organic or other deleterious constituents and shall conform to the grading given in Table 400-1.

3.0 Measurement for Payment

The Reused Granular Sub-Base shall be measured separately as finished in position in cubic metres.

4.0 Rate

The Contract unit rate shall be payment in full for carrying out the required operations including full compensations for:

- i.) Making arrangements for traffic to clause 112 except for initial treatment to verges, shoulders and construction of diversions.
- ii.) Supplying all materials to be incorporated in the work including all royalties, fees, rents where applicable with all leads and lifts
- iii.) All labour tools, equipments and incidentals to complete work to the specifications.
- iv.) Carrying out the work in part widths of road where directed: and
- v.) Carrying out the required tests for quality control.

VOLUME - VI
RATE ANALYSIS



SCHEDULE OF RATE



Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
1	02.01/i	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth from 300 mm to 600 mm	Each	388.42
2	02.01/ii	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 600 mm to 900 mm	Each	716.32
3	02.01/iii	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 900 mm to 1800 mm	Each	1,360.04
4	02.01/iv	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 1800 mm to 2700 mm	Each	2,550.68
5	02.01/v	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 2700 mm	Each	4,287.80
6	02.03/a/i	Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by manual means) In area of light jungle	Ha	77,440.00
7	02.03/a/ii	Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by manual means) In area of thorny jungle	Ha	103,818.00
8	02.03/b	Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by mechanical means)	Ha	59,319.65
9	02.04/i/a	Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. a) Lime concrete, cement concrete/lean mix concrete.	cum	591.45

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
10	02.04/i/b	Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. b)Cement concrete M15 and M20	cum	693.57
11	02.04/i/c	Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above	cum	1,739.01
12	02.04/ii/a	Dismantling Brick / Tile work a)In lime	cum	387.20
13	02.04/ii/b	Dismantling Brick / Tile work b)In cement mortar	cum	489.32
14	02.04/ii/c	Dismantling Brick / Tile work c)In mud	cum	346.35
15	02.04/ii/d	Dismantling Brick / Tile work d)Dry brick pitching or brick saling	cum	325.93
16	02.04/iii/a	Dismantling stone masonry a) Rubble stone masonry in lime	Cum	423.46
17	02.04/iii/b	Dismantling stone masonry b) Rubble stone masonry in cement mortar	Cum	489.32
18	02.04/iii/c	Dismantling stone masonry c) Rubble stone masonry in mud	Cum	387.20
19	02.04/iii/d	Dismantling stone masonry d) Dry rubble masonry	Cum	366.78
20	02.04/iii/e	Dismantling stone masonry e) Dismantling stone pitching/dry stone spalls	Cum	423.02
21	02.04/iii/f	Dismantling stone masonry f) In wire crates including opening of crates and stacking crates materials.	Cum	387.20

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
22	02.04/v	Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. steel works in all type of sections upto a height of 5m or above plinth level excluding cutting of rivet A) Including Dismembering	cum	2,027.17
23	02.04/vii/a	Removing hume pipes class NP-3 a) 300mm to 600mm dia	rm	264.99
24	02.04/vii/b	Removing hume pipes class NP-4 b) Above 600mm to 900mm dia	rm	358.77
25	02.04/vii/c	Removing hume pipes class NP-5 c) Above 900mm dia	rm	614.08
26	02.04/viii/a	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m a) Top bituminous surface dressing or premix carpet	sqm	41.43
27	02.04/viii/b	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m c) Stone metal crust, 50mm to 100mm thick by road roller with scarifier along with 20mm,premix carpet/surface dressing	sqm	57.31
28	02.04/viii/d	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m d) Kankar/Gravel metal crust upto 150mm thick with pickaxes.	sqm	41.53
29	02.04/viii/e	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m e)Kandar/Gravel metal crust upto 150 mm thick with power Roller with scarifier	sqm	33.99
30	02.04/viii/f /ii	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base ii)With road roller attatched with scarifier	sqm	57.08
31	02.06	Dismantling Guard Rails by manual means and disposal of dismantled material with all lifts and up to a lead of 1000 metres, stacking serviceable materials and unserviceable materials separately.	rm	118.94
32	02.08	Removal of Telephone / Electric Poles including excavation and dismantling of foundation concrete and lines under the supervision of concerned department, disposal with all lifts and up to a lead of 1000 metres and stacking the serviceable and unserviceable material separately	each	258.70

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
33	02.4/viii/f/i	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base i)Manual Means	sqm	93.23
34	02/nsc/1	Supplying and laying Hydro Seeding on cutting Surface	sqm	315.00
35	03.01/i/a	Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Ordinary soil a) Manual Means (Depth upto 3m) a) Manual Means (Depth upto 3m)	cum	408.50
36	03.01/i/b	Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Ordinary soil b) Mechanical Means (Depth upto 3m) b) Mechanical Means (Depth upto 3m)	cum	105.88
37	03.01/ii/a	Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Ordinary Rock (not requiring blasting) a) Manual Means (Depth upto 3m) a) Manual Means (Depth upto 3m)	cum	510.60
38	03.01/ii/b	Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Ordinary Rock (not requiring blasting) b) Mechanical Means b) Mechanical Means	cum	142.33

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
39	03.01/iii/a	Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Hard Rock (requiring blasting) a) Manual Means a) Manual Means	cum	982.17
40	03.01/iii/b	Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Hard Rock (requiring blasting) b) Hard Rock (blasting prohibited) Mechanical Means b) Hard Rock (blasting prohibited) Mechanical Means	cum	1,900.61
41	03.01/iv/a	Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Marshy soil a) Manual Means a) Manual Means	cum	773.37
42	03.01/iv/b	Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom, backfilling the excavation earth to the extent required and utilising the remaining earth locally for road work. Marshy soil b) Mechanical Means b) Mechanical Means	cum	269.34
43	03.02/i	Earth work in excavation of foundation trenches etc. in drains and channels etc. not exceeding 2.00 metres depth including dressing of bottom and sides of trenches, stacking the excavated soil clear from the edge of excavation including disposal of surplus soil as directed within a lead of 30.00 metres. Ordinary Soil	cum	326.80
44	03.02/ii/a	Earth work in excavation of foundation trenches etc. in drains and channels etc. not exceeding 2.00 metres depth including dressing of bottom and sides of trenches, stacking the excavated soil clear from the edge of excavation including disposal of surplus soil as directed within a lead of 30.00 metres. Blasting work a) Soft rock a) Soft rock	cum	785.74

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
45	03.02/ii/b	Earth work in excavation of foundation trenches etc. in drains and channels etc. not exceeding 2.00 metres depth including dressing of bottom and sides of trenches, stacking the excavated soil clear from the edge of excavation including disposal of surplus soil as directed within a lead of 30.00 metres. Blasting work b) Hard rock b) Hard rock	cum	1,520.49
46	03.02/iii/a	Earth work in excavation of foundation trenches etc. in drains and channels etc. not exceeding 2.00 metres depth including dressing of bottom and sides of trenches, stacking the excavated soil clear from the edge of excavation including disposal of surplus soil as directed within a lead of 30.00 metres. Chiselling/wedging out of rock (where blasting is prohibited). a) Soft rock a) Soft rock	cum	1,765.25
47	03.02/iii/b	Earth work in excavation of foundation trenches etc. in drains and channels etc. not exceeding 2.00 metres depth including dressing of bottom and sides of trenches, stacking the excavated soil clear from the edge of excavation including disposal of surplus soil as directed within a lead of 30.00 metres. Chiselling/wedging out of rock (where blasting is prohibited). b) Hard rock b) Hard rock	cum	2,647.87
48	03.03/a	Filling in foundation trenches as per drawing and Technical specification a) Sandy Soil	cum	326.10
49	03.03/b	Filling in foundation trenches as per drawing and Technical specification b) Sand Gravel	cum	692.96
50	03.04/i	Earth filling with surplus soil excavated from foundation and taken only from outside of building plinth in 15 cm layers including watering and consolidation lead 30 meters Ordinary Soil	cum	217.49
51	03.12	Construction of Embankment with Material Obtained from Borrow Pits Construction of embankment with approved material obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of table 300-2	cum	226.26
52	03.13	Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2	cum	160.20
53	03.14/Nsc	Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from Roadway Cutting with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2	cum	246.28

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
54	03.14	Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2	cum	312.34
55	03.15	Compacting original ground supporting subgrade Loosening of the ground upto a level of 500 mm below the subgrade level, watered, graded and compacted in layers to meet requirement of table 300-2 for subgrade construction.	cum	86.65
56	03.16	Compacting original ground supporting embankment Loosening, leveling and compacting original ground supporting embankment to facilitate placement of first layer of embankment, scarified to a depth of 150mm, mixed with water at OMC and then compacted dry rolling so as to achieve minimum dry density as given in Table 300-2 for embankment construction.	cum	42.00
57	03.17	Stripping and Storing Top Soil Stripping, storing of top soil by road side at 15 m internal and re-application on embankment slopes, cut slopes and other areas in localities where the available embankment material is not conducive to plant growth	cum	302.68
58	03.19	Turfing with Sods Furnishing and laying of the live sods of perennial turf forming grass on embankment slope, verges or other locations shown on the drawing or as directed by the engineer including preparation of ground, fetching of sods and watering	sqm	61.87
59	03.31	Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres	cum	211.39
60	03.32	Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting. Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres	cum	304.56
61	03.33	Excavation in Hilly Areas in Hard Rock Requiring Blasting Excavation in hilly areas in hard rock requiring blasting, by mechanical means including trimming of slopes and disposal of cut material with all lifts and lead upto 1000 metres.	cum	423.10
62	03/nsc/1	Island and Median Filling From Roadway Cutting	cum	108.52
63	04.01/i	Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading-II Material	Cum	2,949.87
66	04.01/ii	Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading-III Material	Cum	2,893.00

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018 (PWD, Manipur)



Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
69	04.01/Nsc1	Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material	Cum	2,997.00
72	04.02/i	Sub-base with Close Graded Material (Table:- 400-1) By Mix in Place Method Construction of granular sub-base by providing close graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 For Grading- II Material	Cum	2,413.12
75	04.02/ii	Sub-base with Close Graded Material (Table:- 400-1) By Mix in Place Method Construction of granular sub-base by providing close graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 For Grading-III Material	Cum	2,356.25
78	04.03/i	Granular Sub-Base with Coarse Graded Material (Table:- 400- 2) Construction of granular sub-base by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 For Grading- II Material	Cum	2,285.30
80	04.03/ii	Granular Sub-Base with Coarse Graded Material (Table:- 400- 2) Construction of granular sub-base by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401 For Grading-III Material	Cum	2,230.59
82	04.04	Granular Sub-Base with Naturally Occuring Sand Gravel Material Providing, laying, spreading and compacting granular base/sub-base according to lines, grades and cross sections by using naturally occurred sand gravel/conforming to IRC-Grd-II of MOST specification free from organic or other deletereous constituent spreading with motor grader and compacted by rolling with power roller of 8-10 capacity in layers not exceeding 150mm (spread thickness) i/c rolling of the road surface to proper level and grades 30 cm width edging on both side etc. complete as directed by Engineer-in-charge.	Cum	782.55
84	04.06/a	Lime Stabilisation for Improving Subgrade (Laying and spreading available soil in the subgrade on a prepared surface, pulverising, mixing the spread soil in place with rotavator with 3% slaked lime having minimum content of 70% of CaO, grading with motor grader and compacting with the road roller at OMC to the desired density to form a layer of improved sub grade) By Mechanical Means	Cum	1,652.44

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
85	04.06/b	Lime Stabilisation for Improving Subgrade (Laying and spreading available soil in the subgrade on a prepared surface, pulverising, mixing the spread soil in place with rotavator with 3% slaked lime having minimum content of 70% of CaO, grading with motor grader and compacting with the road roller at OMC to the desired density to form a layer of improved sub grade) By Manual Means	Cum	1,662.67
86	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401	Cum	2,063.00
87	05.01/b/a	WBM/Providing, laying, spreading and compacting stone aggregate of specific sizes to water bound macadam specification including spreading in uniform thickness, hand packing, rolling with power roller 8-10 tones in stages to proper grade and camber, applying and brooming requisite type of screening & binding materials to fill up the interstices of coarse aggregates, watering and rolling making necessary earthen bund to protect edges, lighting, guarding, barricading and maintenance of diversion etc.	cum	2,216.15
90	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)	Cum	2,965.34
92	05.03	Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar including provision of all drainage arrangements but excluding kerb channel.	sqm	1,374.51
96	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm	sqm	57.54
97	06.01/b	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) B) Stabilised Soil Based / Crusher run macadam 0.9 - 1.2kg /sqm	sqm	97.04
98	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm	sqm	15.63
99	06.02/ii	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. ii) On granular Surface Pre treated with prime Coat @ 0.25 - 0.30 kg/sqm	sqm	17.16
100	06.02/iii	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. iii) On cement concrete pavement @ 0.300 - 0.35 kg/sqm	sqm	22.22

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
101	06.06/i	Dense Graded Bituminous Macadam (Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects.) for Grading I (40 mm nominal size) Using bitumen 60/70	cum	10,661.33
104	06.06/ii	Dense Graded Bituminous Macadam (Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects.) for GradingII(19 mm nominal size) Using bitumen 60/70	cum	10,707.15
107	06.08/i/a	Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-I (19 mm nominal size) A) Using Bitumen 60/70	cum	12,064.76
110	06.08/i/b	Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-I (19 mm nominal size) B) Using Bitumen CRMB Gr-55	cum	12,622.49

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
111	06.08/i/c	Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-I (19 mm nominal size) C) Using Bitumen PMB 70	cum	15,913.73
112	06.08/ii/a	Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-II(13 mm nominal size) A) Using Bitumen 60/70	cum	11,950.36
115	06.08/ii/b	Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-II(13 mm nominal size) B) Using Bitumen CRMB Gr-55	cum	15,599.71
116	06.08/ii/c	Bituminous Concrete (Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects) for Grading-II(13 mm nominal size) C) Using Bitumen PMB 70	cum	15,898.91
117	06.10/A	Open - Graded Premix Surfacing Providing, laying and rolling of open - graded premix surfacing of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregates either using penetration grade bitumen or cut-back or emulsion to required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant, laying and rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades. A)Mechanical method using Penetration grade Bitumen and HMP of appropriate capacity not less than 75 tonnes/hour .	Sqm	149.23

Item Rate Analysis has been done considering



Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
119	06.10/C	Open - Graded Premix Surfacing Providing, laying and rolling of open - graded premix surfacing of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregates either using penetration grade bitumen or cut-back or emulsion to required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant, laying and rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades. C)Open-Graded Premix Surfacing using cationic Bitumen Emulsion	Sqm	183.17
121	06.12/I	Providing and laying seal coat sealing in the voids in a bituminous surface laid to the specific levels,grade and cross fall using Type A and B Seal Coats Type A	sqm	67.22
122	06.12/II	Providing and laying seal coat sealing in the voids in a bituminous surface laid to the specific levels,grade and cross fall using Type A and B Seal Coats Type B/Providing and Laying of premix sand seal coat with HMP of appropriate capacity not less than 75 tonnes/hour using crushed stone chipping 6.7mm size and penetration bitumen of suitable grade	sqm	53.67
123	06.16	Mastic Asphalt (Providing and laying 25 mm thick mastic asphalt wearing course with paving grade bitumen meeting the requirements given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine-grained hard stone chipping of 13.2 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 1000C, protruding 1 mm to 4 mm over mastic surface, all complete as per clause 515.)	sqm	1,182.63
129	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40	cum	11,264.00
132	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	12,371.00
135	08.01	Precast Cement concrete M20 Kerb including fixing at site	rm	622.79

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
138	08.02/a	Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. a) 5th KM stone	each	4,556.84
142	08.02/b	Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. b) Ordinary kilometer stone	each	2,676.24
146	08.02/nsc	M15 stone of standard design fixed in Position including painting and painting letters etc. Hectometer stone (precast)	each	2,269.00
150	08.04	Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting	each	843.03
153	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	93.41
154	08.06	Painting on Steel Surfaces Providing and applying two coats of ready mix paint of approved brand on steel surface after through cleaning of surface to give an even shade	sqm	85.06
155	08.11/i	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm equilateral triangle	each	4,931.35
159	08.11/ii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm equilateral triangle	each	3,621.96
163	08.11/iii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm circular	each	4,440.80

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
167	08.11/iv	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 80 mm x 60 mm rectangular	each	5,706.23
171	08.11/v	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm x 45 cm rectangular	each	4,249.15
175	08.11/vi	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm x 60 cm square	each	5,200.94
179	08.11/vii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm high octagon	each	8,165.25
183	08.12	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign as per IRC:67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing)	sqm	12,223.04
187	08.13	Direction and Place Identification signs with size more than 0.9 sqm size board. (Providing and erecting direction and place identification retro- reflectorised sign as per IRC :67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area exceeding 0.9 sqm supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm, 2 Nos. firmly fixed to the ground by means of properly designed foundation with M 15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing)	sqm	12,831.40

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
191	08.14	Road Marking with Hot Applied Thermoplastic Compound with Reflectorisng Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorisng glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.)	sqm	1,002.14
192	08.15/a	Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorisng panels at the top, buried or pressed into the ground and confirming toIRC-79 and the drawings.) a)Cat Eye	Nos	296.53
193	08.15/b	Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorisng panels at the top, buried or pressed into the ground and confirming toIRC-79 and the drawings.) b)Median Marker	Nos	545.50
194	08.15/c/v	Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorisng panels at the top, buried or pressed into the ground and confirming toIRC-79 and the drawings.) 120x120 -Road Delineator	each	1,063.19
195	08.15/f/iii	Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorisng panels at the top, buried or pressed into the ground and confirming toIRC-79 and the drawings.) f)Speed Bumps(500mm x 425mm x 75mm)	Piece	3,078.32
196	08.17/nsc	RCC Crash Barrier	m	6,947.00
200	08.18/A/a	Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.2 m	Rm	2,757.81

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
201	08.18/A/b	<p>Metal Beam Crash Barrier</p> <p>Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810)</p> <p>For post Height of 1.5 m</p>	Rm	3,334.08
202	08.18/A/c	<p>Metal Beam Crash Barrier</p> <p>Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810)</p> <p>For post Height of 1.8 m</p>	Rm	3,591.20
203	08.19	<p>Cable Duct Across the Road</p> <p>Single row for one utility service</p>	m	3,039.00
204	08.20/ii	<p>Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973</p> <p>Light Reflecting Lense Type</p>	nos	383.64
205	08.21/i	<p>Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973</p> <p>Solar light emitting Diodes</p>	nos	2,595.21
206	08.22	<p>Lighting on Bridges Providing & fixing lighting on Bridges, mounted on steel hollow circular poles of standard specification, 5 m high fixed on parapets with cement concrete, 20 m apart and fitted with sodium vapour lamp</p>	nos	21,165.02
207	08/nsc/2	<p>Convex Mirror For Blind Curve</p>	nos	5,000.00

Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
208	08/nsc/4/a	Overhead Signs Providing and erecting overhead signs with a corrosion resistant 2mm thick aluminium alloy sheet reflectorised with high intensity retro-reflective sheeting of encapsulated lense type with vertical and lateral clearance given in clause 802.2 and 802.3 and installed as per clause 802.7 over a designed support system of aluminium alloy or galvanised steel trestles and trusses of sections and type as per structural design requirements and approved plans A)Truss and Vertical Support with Base plate on foundation column.	Ton	183,662.00
209	08/nsc/4/b	Overhead Signs Providing and erecting overhead signs with a corrosion resistant 2mm thick aluminium alloy sheet reflectorised with high intensity retro-reflective sheeting of encapsulated lense type with vertical and lateral clearance given in clause 802.2 and 802.3 and installed as per clause 802.7 over a designed support system of aluminium alloy or galvanised steel trestles and trusses of sections and type as per structural design requirements and approved plans B)Aluminium Alloy Plate for Over Head Sign	sqm	695.00
210	08/nsc/5	Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	m	6,927.00
211	08/nsc/6	Rumble Strips Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint.	sqm	1,224.98
212	09.01/nsc1	Laying Reinforced Cement Concrete Pipe NP4/ Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia	Rm	11,638.00
215	10.02/Nsc	Plain cement concrete M-15 mix with stone aggregate 20mm. Nominal size mechanically mixed and vibrated in foundation depth of 1.5m. below ground / bed level and or 1.5m. above ground/bed level i/c formwork. At Protection	cum	7,496.35
218	10.06/a	Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Sub-Structure	Ton	72,983.59
219	10.06/b	Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Super-Structure	Ton	72,983.59
220	10.11	Random rubble masonry (uncoursed) in cement sand mortar 1:3 in foundation upto a depth of 1.5m. and 1.5m. above ground/bed level.	cum	5,662.85
221	10.16	Cement Plaster 12mm Thick in Cement Morter 1:3	sqm	223.49

Item Rate Analysis has been done considering



Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
222	10.19	Dry Boulder pitching	cum	1,701.75
223	10.20/a	Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting a)Good Sandy Soil free from organic material	cum	785.50
224	10.20/b	Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting b)Selected Granular Material in Filling	cum	1,174.31
225	10.20/c	Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting c)Filler Media behind abutment ,wing and return wall	cum	1,157.28
226	10.20	Plain cement concrete M-15 mix with stone aggregate 20mm. Nominal size mechanically mixed and vibrated in foundation depth of 1.5m. below ground / bed level and or 1.5m. above ground/bed level i/c formwork.	cum	7,496.35
229	10.23/a	Reinforced Cement Concrete M-30 Mixed with Stone aggregate 20 mm nominal soze mechanical mixed and vibrated for reinforced concrete work in slab excluding steel reinforcement but including centering and shuttering and laied in position. a)For Sub-Structure	cum	14,404.16
232	10.23/b	Reinforced Cement Concrete M-30 Mixed with Stone aggregate 20 mm nominal soze mechanical mixed and vibrated for reinforced concrete work in slab excluding steel reinforcement but including centering and shuttering and laied in position. b)For Super-Structure	cum	14,404.16
235	10.24/a	Laying Reinforced Cement Concrete Pipe(Hume Pipe)/Prestressed Concrete Pipe on First Class Beading in Single ROW(Cost of NP 4 To be Paid Separately). This includes fixing collar with cement mortar 1:2 but excluding excavation,protection works,backfilling,concrete and masonry works in heads walls and parapet a)1000 mm dia	m	711.07
236	10.24/b	Laying Reinforced Cement Concrete Pipe(Hume Pipe)/Prestressed Concrete Pipe on First Class Beading in Single ROW(Cost of NP 4 To be Paid Separately). This includes fixing collar with cement mortar 1:2 but excluding excavation,protection works,backfilling,concrete and masonry works in heads walls and parapet b)1200 mm dia	m	877.98
237	12/Nsc1	Geo-synthetics and Reinforced Earth With reinforcing elements of synthetic geogrids	Sqm	512.00
238	12/Nsc2	Geo-synthetics and Reinforced Earth Facing elements of RCC	Sqm	3,873.00
242	23/Nsc1	560 mm Dia cover with frame(Heavy Duty)[Ref: Delhi CPWD SOR 2007 Code 3860]	Nos	9,160.80

Item Rate Analysis has been done considering

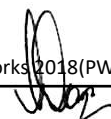



Schedule Of Rate

SI No	SOR Ref	Item description	Unit	SOR Rate
243	23/Nsc2	Rectangular shape 600x450 mm precast R.C.C. manhole cover(CPWD; Delhi SOR 2014)	Each	958.00
244	24/i/b	Galvanised Mild steel J /L hook	kg	120.00
245	40	Gextextile material (fine net)	sqm	25.50
246	9.2/b/Nsc	Laying Reinforced Cement Concrete Pipe(Hume Pipe)/Prestressed Concrete Pipe on First Class Beading in Single ROW(Cost of NP 4 To be Paid Separately). This includes fixing collar with cement mortar 1:2 but excluding excavation,protection works,backfilling,concrete and masonry works in heads walls and parapet b)1200 mm dia	m	11,638.00

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)




LEAD CHART



Leads for Various Materials

Sl. No.	Name of Material	Name of Source	Distance from Source to Mid Point of Project Road (Km)	Approach Road (Km)	Total Lead (Km)
1	Sand (Fine)	Noney	39.47	2	41.47
2	Filling Material	Local	-	-	10.00
3	Stone Metal	Noney	39.47	2	41.47
4	Stone Boulder	Barak	120.47	2	122.47
5	Stone Chips, Aggregate	Barak	120.47	2	122.47
6	Coarse Sand	Noney	39.47	2	41.47
7	Cement	Imphal	24.53	-	24.53
8	Steel	Imphal	24.53	-	24.53
9	Bitumen	Imphal	24.53	-	24.53
10	Bitumen Emulsion	Imphal	24.53	-	24.53
11	Structural Steel	Imphal	24.53	-	24.53
12	RCC Pipe	Imphal	24.53	-	24.53




CARRIAGE COST



Carriage Cost of Material (Including loading & unloading)

Rubbish

Name of Quarries Local
Lead Upto Site (Km)= 10

Sl.No.	Lead (km)	Kilometer	Unit	Carriage (Km)	Rate (Rs)	Cost of Carriage (In Rs)
1	10.00	Upto 1	per m ³		163.65	
		Upto 2	per m ³		190.55	
		Upto 3	per m ³		216.97	
		Upto 4	per m ³		242.32	
		Upto 5	per m ³	5	266.68	266.68
		for Every km beyond 5 km up to 10 km	per m ³	5	26.51	132.55
					Total	399.23

Stone aggregate below 40mm nominal size

Name of Quarries Noney
Lead Upto Site (Km)= 41.47

Sl.No.	Lead in km	Kilometer	Unit	Carriage (Km)	Rate (Rs)	Cost of Carriage (In Rs)
2	41.47	Upto 1	per m ³		156.35	
		Upto 2	per m ³		182.05	
		Upto 3	per m ³		207.29	
		Upto 4	per m ³		231.51	
		Upto 5	per m ³	5	254.79	254.79
		for Every km beyond 5 km up to 10 km	per m ³	5	25.33	126.65
		for Every km beyond 10 km up to 20 km	per m ³	10	20.42	204.20
		for Every km beyond 20 km	per m ³	21.47	16.51	354.47
					Total	940.11

Sand

Name of Quarries Noney
Lead Upto Site (Km)= 41.47

Sl.No.	Lead in km	Kilometer	Unit	Carriage (Km)	Rate (Rs)	Cost of Carriage (In Rs)
3	41.47	Upto 1	per m ³		156.35	
		Upto 2	per m ³		182.05	
		Upto 3	per m ³		207.29	
		Upto 4	per m ³		231.51	
		Upto 5	per m ³	5	254.79	254.79
		for Every km beyond 5 km up to 10 km	per m ³	5	25.33	126.65
		for Every km beyond 10 km up to 20 km	per m ³	10	20.42	204.20
		for Every km beyond 20 km	per m ³	21.47	16.51	354.47
					Total	940.11

Boulder

Name of Quarries Barak
Lead Upto Site (Km)= 122.47



Sl.No.	Lead in km	Kilometer	Unit	Carriage	Rate (Rs)	Cost of Carriage (In Rs)
4	122.47	Upto 1	per m ³		173.23	
		Upto 2	per m ³		201.95	
		Upto 3	per m ³		229.94	
		Upto 4	per m ³		256.81	
		Upto 5	per m ³	5	282.63	282.63
		for Every km beyond 5 km up to 10 km	per m ³	5.00	28.10	140.50
		for Every km beyond 10 km up to 20 km	per m ³	10.00	22.65	226.50
		for Every km beyond 20 km	per m ³	102.47	18.31	1876.23
					Total	2525.86

Cement, Steel

Name of Quarries **Imphal**

Lead Upto Site (Km)= **24.53**

Sl.No.	Lead in km	Kilometer	Unit	Carriage	Rate (Rs)	Cost of Carriage (In Rs)
5	24.53	Upto 1	per Tone		112.15	
		Upto 2	per Tone		130.59	
		Upto 3	per Tone		148.70	
		Upto 4	per Tone		166.07	
		Upto 5	per Tone	5	182.77	182.77
		for Every km beyond 5 km up to 10 km	per Tone	5	18.17	90.85
		for Every km beyond 10 km up to 20 km	per Tone	10	14.65	146.50
		for Every km beyond 20 km	per Tone	4.53	11.84	53.64
					Total	473.76

Bitumen

Name of Quarries **Imphal**

Lead Upto Site (Km)= **24.53**

Sl.No.	Lead in km	Kilometer	Unit	Carriage	Rate (Rs)	Cost of Carriage (In Rs)
6	24.53	Upto 1	per Tone		112.15	
		Upto 2	per Tone		130.59	
		Upto 3	per Tone		148.70	
		Upto 4	per Tone		166.07	
		Upto 5	per Tone	5	182.77	182.77
		for Every km beyond 5 km up to 10 km	per Tone	5	18.17	90.85
		for Every km beyond 10 km up to 20 km	per Tone	10	14.65	146.50
		for Every km beyond 20 km	per Tone	4.53	11.84	53.64
					Total	473.76

PIPE

300 mm Dia RCC Pipe from Imphal

Lead Upto Site (Km)= **24.53**

Sl.No.	Lead in km	Kilometer	Unit	Carriage	Rate (Rs)	Cost of Carriage (In Rs)
7	25	upto 5	Rm	5	18.73	18.73
		for Every km beyond 5 km up to 10 km	Rm	5	1.86	9.30
		for Every km beyond 10 km up to 20 km	Rm	10	1.50	15.00
		for Every km beyond 20 km	Rm	5	1.21	
					Total	48.51

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FINISHED RATE



FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
1	02.01/i	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth from 300 mm to 600 mm	Each	388.42					0.00	392.30
2	02.01/ii	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 600 mm to 900 mm	Each	716.32					0.00	723.48
3	02.01/iii	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 900 mm to 1800 mm	Each	1,360.04					0.00	1,373.64
4	02.01/iv	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 1800 mm to 2700 mm	Each	2,550.68					0.00	2,576.19

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
5	02.01/v	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 2700 mm	Each	4,287.80					0.00	4,330.68
6	02.03/b	Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of un-serviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by mechanical means)	Ha	59,319.65					0.00	59,912.85
7	02.04/i/c	Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above	cum	1,739.01					0.00	1,756.40
8	02.04/iii/b	Dismantling stone masonry b) Rubble stone masonry in cement mortar	Cum	489.32					0.00	494.21
9	02.04/vii/a	Removing hume pipes class NP-3 a) 300mm to 600mm dia	rm	264.99					0.00	267.64

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)




FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
10	02.04/vii/b	Removing hume pipes class NP-4 b) Above 600mm to 900mm dia	rm	358.77					0.00	362.36
11	02.04/vii/c	Removing hume pipes class NP-5 c) Above 900mm dia	rm	614.08					0.00	620.22
12	02.04/viii/e	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m e)Kandar/Gravel metal crust upto 150 mm thick with power Roller with scarifier	sqm	33.99					0.00	34.33
13	02.04/viii/f /ii	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base ii)With road roller attatched with scarifier	sqm	57.08					0.00	57.65
14	03.13	Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2	cum	160.20					0.00	161.80

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)




FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
15	03.14/Nsc	Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from Roadway Cutting with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2	cum	246.28					0.00	248.74
16	03.14	Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2	cum	312.34					0.00	315.46
17	03.31	Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres	cum	211.39					0.00	213.50
18	03.32	Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting. Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres	cum	304.56					0.00	307.61

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)




FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
19	04.01/Nsc1	Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material	Cum	2,997.00					1,193.94	4,232.85
					Course Sand	0.380	cum	940.11		
					Stone	0.250	cum	940.11		
					Chips/Aggregate					
					Stone Metal Cat1	0.640	cum	940.11		
20	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401	Cum	2,063.00					0.00	2,083.63
21	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)	Cum	2,965.34					1,240.95	4,248.35
					Course Sand	0.396	cum	940.11		

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
					Stone Metal Cat1	0.924	cum	940.11		
22	05.03	Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar including provision of all drainage arrangements but excluding kerb channel.	sqm	1,374.51					236.01	1,626.63
					Cement	0.012	Ton	473.76		
					Sand	0.064	cum	940.11		
					Stone Chips/Aggregate	0.112	cum	940.11		
					Stone Metal Cat1	0.069	cum	940.11		
23	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm	sqm	57.54					0.33	58.45
					Bitumen Emulsion	0.001	Ton	473.76		
24	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm	sqm	15.63					0.09	15.88
					Bitumen Emulsion	0.000	Ton	473.76		

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
25	06.02/ii	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. ii) On granular Surface Pre treated with prime Coat @ 0.25 - 0.30 kg/sqm	sqm	17.16	Bitumen Emulsion	0.000	Ton	473.76	0.12	17.45
26	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40	cum	11,264.00	Aggregate Bitumen 30/40 Filler	1.440 0.104 0.040	cum Ton Ton	940.11 473.76 399.23	1,419.00	12,809.83

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)




FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
27	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5% of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	12,371.00					1,442.37	13,951.50
					Aggregate	1.456	cum	940.11		
					Bitumen 30/40	0.130	Ton	473.76		
					Filler	0.030	Ton	399.23		
28	08.02/a	Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. a) 5th KM stone	each	4,556.84					550.38	5,158.29
					Cement	0.108	Ton	473.76		
					Sand	0.176	cum	940.11		
					Steel	0.004	Ton	473.76		
					Stone	0.353	cum	940.11		
					Chips/Aggregate					
29	08.02/b	Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. b) Ordinary kilometer stone	each	2,676.24					377.22	3,083.99
					Cement	0.074	Ton	473.76		

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
					Sand	0.121	cum	940.11		
					Steel	0.002	Ton	473.76		
					Stone Chips/Aggregate	0.242	cum	940.11		
30	08.04	Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting	each	843.03					1,651.13	2,519.10
					Sand	0.566	cum	940.11		
					Steel	0.080	Ton	473.76		
					Stone Chips/Aggregate	1.150	cum	940.11		
31	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	93.41					0.00	94.34
32	08.11/i	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm equilateral triangle	each	4,931.35					633.83	5,620.83
					Cement	0.033	Ton	473.76		
					Sand	0.540	cum	940.11		
					Steel	0.019	Ton	473.76		

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
					Stone Chips/Aggregate	0.108	cum	940.11		
33	08.11/iii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm circular	each	4,440.80					633.83	5,125.38
					Cement	0.033	Ton	473.76		
					Sand	0.540	cum	940.11		
					Steel	0.019	Ton	473.76		
					Stone Chips/Aggregate	0.108	cum	940.11		
34	08.11/iv	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 80 mm x 60 mm rectangular	each	5,706.23					633.83	6,403.46
					Cement	0.033	Ton	473.76		
					Sand	0.540	cum	940.11		

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
					Steel	0.019	Ton	473.76		
					Stone Chips	0.108	cum	940.11		
35	08.11/vii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm high octagon	each	8,165.25					633.83	8,887.07
					Cement	0.033	Ton	473.76		
					Sand	0.540	cum	940.11		
					Steel	0.019	Ton	473.76		
					Stone Chips/Aggregate	0.108	cum	940.11		
36	08.12	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign as per IRC:67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing)	sqm	12,223.04					196.70	12,543.94
					Cement	0.037	Ton	473.76		

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
					Sand	0.060	cum	940.11		
					Steel	0.021	Ton	473.76		
					Stone Chips/Aggregate	0.120	cum	940.11		
37	08.14	Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35. The finished surface to be level, uniform and free from streaks and holes.)	sqm	1,002.14					0.00	1,012.16
38	08.15/c/v	Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and conforming to IRC-79 and the drawings.) 120x120 -Road Delineator	each	1,063.19					0.00	1,073.82

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
39	08.18/A/b	Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fittings to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.5 m	Rm	3,334.08					0.00	3,367.42
40	08.20/ii	Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973 Light Reflecting Lense Type	nos	383.64					0.00	387.48
41	08.22	Lighting on Bridges Providing & fixing lighting on Bridges, mounted on steel hollow circular poles of standard specification, 5 m high fixed on parapets with cement concrete, 20 m apart and fitted with sodium vapour lamp	nos	21,165.02					0.00	21,376.67

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
42	08/nsc/2	Convex Mirror For Blind Curve	nos	5,000.00					0.00	5,050.00
43	08/nsc/5	Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	m	6,927.00					0.00	6,996.27
44	08/nsc/6	Rumble Strips Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint.	sqm	1,224.98					0.00	1,237.23
45	09.01/nsc1	Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia	Rm	11,638.00	Aggregate	0.400	cum	940.11	385.47	12,143.70
					Cement	0.006	Ton	473.76		

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
					Course Sand	0.007	cum	940.11		
46	10.06/a	Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Sub-Structure	Ton	72,983.59	Steel	1.050	Ton	473.76	497.45	74,215.85
47	10.06/b	Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Super-Structure	Ton	72,983.59	Steel	1.050	Ton	473.76	497.45	74,215.85
48	10.16	Cement Plaster 12mm Thick in Cement Mortar 1:3	sqm	223.49					0.00	225.72
49	10.19	Dry Boulder pitching	cum	1,701.75	Stone Bolder	1.200	cum	2,525.86	3,031.03	4,780.11
50	10.20/b	Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting b)Selected Granular Material in Filling	cum	1,174.31	Stone Chips/Aggregate	1.200	cum	940.11	1,128.13	2,325.46
51	10.20/c	Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting c)Filler Media behind abutment ,wing and return wall	cum	1,157.28					1,128.13	2,308.26

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

FINISHER RATE

Road Works

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
					Stone Chips/Aggregate	1.200	cum	940.11		
52	10.20	Plain cement concrete M-15 mix with stone aggregate 20mm. Nominal size mechanically mixed and vibrated in foundation depth of 1.5m. below ground / bed level and or 1.5m. above ground/bed level i/c formwork.	cum	7,496.35	Aggregate	0.850	cum	940.11	1,378.48	8,963.58
					Cement	0.330	Ton	473.76		
					Sand	0.450	cum	940.11		
53	24/i/b	Galvanised Mild steel J /L hook	kg	120.00					0.00	121.20
54	40	Gextextile material (fine net)	sqm	25.50					0.00	25.76

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering




FINISHER RATE

Minor Bridge

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
1	13.01/a/i/N sc	Earth work in excavation Ordinary soil For Protection Work	cum	218.93					0.00	221.12
2	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	218.93					0.00	221.12
3	13.01/b/ii	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to	cum	209.22					0.00	211.31
4	13.03/a	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials	cum	1,007.86	Stone Chips/Aggregate	1.200	cum	940.11	1,128.13	2,157.35
5	13.03/b	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material	cum	617.02					1,128.13	1,762.60

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)

FINISHER RATE

Minor Bridge

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
					Sand	1.200	cum	940.11		
6	13.04	Filter medium behind abutment,wing wall and return wall complete as per drawing and technical specification .	cum	1,274.65					1,128.13	2,426.81
					Stone Chips/Aggregate	1.200	cum	940.11		
7	13/nsc1	Confirmatory Boring in Soil	cum	2,000.00					0.00	2,020.00
8	13/nsc2	Confirmatory Boring in Hard Rock	cum	4,000.00					0.00	4,040.00
9	14.01	Brick masonry work in cement mortar 1:3 in foundation complete excluding pointing and plastering, as per drawing and technical specifications	cum	11,849.87					0.00	11,968.37
10	14.02/b	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	6,306.36					1,453.10	7,837.05
					Cement	0.170	Ton	473.76		
					Sand	0.300	cum	940.11		
					Stone Metal Cat1	1.160	cum	940.11		

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Minor Bridge

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
11	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	8,348.21					1,378.48	9,823.96
					Aggregate	0.850	cum	940.11		
					Cement	0.330	Ton	473.76		
					Sand	0.450	cum	940.11		
12	14.03/b	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M20 Grade	cum	9,333.75					1,449.18	10,890.76
					Aggregate	0.900	cum	940.11		
					Cement	0.380	Ton	473.76		
					Sand	0.450	cum	940.11		
13	14.03/e/II	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M25Grade	cum	9,077.25					1,463.39	10,646.05
					Aggregate	0.900	cum	940.11		
					Cement	0.410	Ton	473.76		
					Sand	0.450	cum	940.11		
14	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification	MT	77,427.65					497.45	78,704.35
					Steel	1.050	Ton	473.76		

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)




FINISHER RATE

Minor Bridge

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
15	14/nsc2	Brick Flat Soling at Foundation	Sqm	1,077.89	Brick	1.000	Sqm	40.00	40.00	1,129.07
16	15.01	Brick masonry work in cement mortar 1:3 in Sub-structure complete excluding pointing and plastering, as per drawing and technical specifications	cum	11,961.59					0.00	12,081.21
17	15.02/b	Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	6,787.85	Cement	0.170	Ton	473.76	1,453.10	8,323.36
					Sand	0.300	cum	940.11		
					Stone Metal Cat1	1.160	cum	940.11		
18	15.03/b/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m	cum	9,067.33	Cement	0.344	Ton	473.76	1,432.12	10,604.44
					Sand	0.450	cum	940.11		
					Stone Chips/Aggregate	0.900	cum	940.11		

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)




FINISHER RATE

Minor Bridge

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
19	15.03/f/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height	cum	9,938.25	Cement Sand Stone Chips/Aggregate	0.403 0.450 0.900	Ton cum cum	473.76 940.11 940.11	1,460.07	11,512.30
20	15.05	HYS D bar reinforcement in Sub-structure complete as per drawing and technical specification	MT	77,427.65	Steel	1.050	Ton	473.76	497.45	78,704.35
21	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	445.75	Cement Sand	0.001 0.002	Ton cum	473.76 940.11	2.12	452.35
22	16.01/a/i	cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complete as per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m	cum	10,446.36	Cement Course Sand	0.400 0.452	Ton cum	473.76 940.11	1,460.53	12,025.96

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Minor Bridge

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
					Stone Chips/Aggregate	0.900	cum	940.11		
23	16.03	HYSR bar reinforcement in super-structure complete as per drawing and technical specifications	MT	85,183.86	Steel	1.050	Ton	473.76	497.45	86,538.12
24	16.09	Mild steel railing complete as per drawing and Technical Specifications	Rm	4,559.31	Steel	0.043	Ton	473.76	20.32	4,625.43
25	16.11	Drainage Spouts complete as per drawing and Technical specification	each	2,158.99	Structural Steel	0.004	Ton	473.76	1.90	2,182.50
26	16.17	Mastic asphalt (providing and laying 12mm thick mastic asphalt wearing courses on top of deck slab excluding prime coat with paving grade bitumen meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10sqm and at an approximate spacing of 10cm centre in both direction ,pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface ,all complete as per clause 515) using Bitumen VG-40 (3/40)	sqm	532.56	Bitumen	0.003	Ton	473.76	16.01	554.06

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



FINISHER RATE

Minor Bridge

SI No	State SOR Ref	Item description	Unit	SOR Rate	Material	Material Qty/Unit	Material Unit	Material Carr Cost	Carriage Cost	Finished Rate
					Lime	0.005	Ton	399.23		
					Stone	0.014	cum	940.11		
					Chips/Aggregate					
27	16/nsc	For Protection Work - cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade upto 5m height	cum	9,067.33					1,432.12	10,604.44
					Cement	0.344	Ton	473.76		
					Sand	0.450	cum	940.11		
					Stone	0.900	cum	940.11		
					Chips/Aggregate					

**Note: Finished Rate inclusive of 1% Labour Cess

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD,Manipur)



NON SCHEDULE ITEM



Analysis of Non-Schedule Rate

SUB-BASES, BASES (NON- BITUMINOUS) AND SHOULDERS

Sr No	Ref. to MoRTH Spec.		Description	Unit	Quantity	Rate Rs	Cost Rs
4.1	401		Granular Sub-Base with Close Graded Material (Table:- 400-1) (Material Reuse)				
		A	Plant Mix Method				
			Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on				
			<i>Unit = cum</i>				
			<i>Taking output = 225 cum (450 tonne)</i>				
			a) Labour				
			Mate	day	0.400	550.000	220.00
			Mazdoor skilled	day	2.000	450.000	900.00
			Mazdoor Unskilled	day	8.000	400.000	3200.00
			b) Machinery				
			Wet mix plant @ 60 tonne capacity per hour	hour	6.000	5362.583	32175.50
			Electric generator 160 KVA	hour	6.000	2202.500	13215.00
			Water tanker	hour	4.500	992.333	4465.50
			Excavator Cum Loader	hour	6.000	1755.333	10532.00
			Tipper 6.5-10 tonne	tonne.	450 x L	63.897	25878.51
			Add 10 per cent of cost of carriage to cover loading and unloading				25878.25
			Motor Grader (BEML-092)	hour	6.000	5049.167	30295.00
			Vibratory roller 8-10 t	hour	6.000	1743.333	10460.00
			c) Material				
			Close graded Granular sub-base Material as per table 400-1				
			For Grading-II Material				
			26.5 mm to 9.5 mm @ 35 per cent	cum	100.800	0.00	0.00
			9.5 mm to 2.36 mm @ 25 per cent	cum	72.000	0.00	0.00
			2.36 mm below @ 40 per cent	cum	115.200	0.00	0.00
			Cost of water	KL	27.000	125.00	3375.00
4.1A		(i)	Rate per cum for grading-II Material				
			d) Overhead charges @ input on (a+b+c)				31479.90
			e) Contractor's profit @ input on (a+b+c+d)				42497.87
			Cost for 225 cum = a+b+c+d+e				464101.53
			Rate per cum = (a+b+c+d+e)/225				2062.67
						<i>say</i>	2063.00
			Labour Cess@1%				20.63
			Rate per cum =				2083.63




CHAPTER - 3

EARTH WORK, EROSION CONTROL AND DRAINAGE

Sr No	Ref. to MoRTH Spec.	Description	Unit	Quantity	Rate Rs	Cost Rs
3.12	305	Construction of Embankment with Material obtained from Borrowpits				
		Construction of embankment with approved material obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of table 300-2.	cum		226.26	-----i
3.13	305	Construction of Embankment with Material Deposited from Roadway Cutting				
		Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2.	cum		160.20	-----ii
		So, Cost of Material obtained from Borrow Pit is Rs. =			66.06	----- (iii=i-ii)
3.14	305	Construction of Subgrade and Earthen Shoulders				
		Construction of sub-grade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2	cum		312.34	-----iv
		So,				
		Construction of Subgrade and Earthen Shoulders				
		Construction of embankment with approved material obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of table 300-2.	cum		246.28	----- (v=iv-iii)



CHAPTER-8								
TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES								
Sr No	Ref. to MoRTH Spec.		Description	Unit	Quantity	Rate Rs	Cost Rs	Remarks/ Input ref.
8.7	802		Overhead Signs					
			Providing and erecting overhead signs with a corrosion resistant 2mm thick aluminium alloy sheet reflectorised with high intensity retro-reflective sheeting of encapsulated lense type with vertical and lateral clearance given in clause 802.2 and 802.3 and installed as per clause 802.7 over a designed support system of aluminium alloy or galvanised steel trestles and trusses of sections and type as per structural design requirements and approved plans					
		A	Truss and Vertical Support					
			<i>Unit = tonne</i>					
			<i>Taking output = 1 tonne</i>					
			a) Labour					
			Mate	day	0.240	550.00	132.00	L-12
			Blacksmith	day	2.000	550.00	1100.00	L-02
			Mazdoor including for handling & fixing at site.	day	4.000	450.00	1800.00	L-13
			b) Material					
			Aluminium alloy/galvanised steel including 5 per cent wastage	tonne	1.050	120000.00	126000.00	M-060
			Add 1 per cent on cost of material for nuts, bolts and drilling and welding consumables				1260.00	
			Add 15 per cent on cost of material for fabrication of trusses as per approved design				19089.00	
			c) Machinery					
			Crane 3 tonne capacity	hour	3.000	1525.88	4577.65	P&M-013
			Truck	hour	0.500	1277.94	638.97	P&M-057
			d) Overhead charges @ 8% on (a+b+c)				12367.81	
			e) Contractor's profit @ 10% on (a+b+c+d)				16696.54	
			Rate per tonne = (a+b+c+d+e)				183661.97	
						say	183662.00	
8.7		B	Aluminium Alloy Plate for Over Head Sign					
			<i>Unit = sqm</i>					
			Taking output = 1 sqm					
			a) Labour					
			Mate	day	0.020	550.00	11.00	L-12
			Blacksmith	day	0.100	550.00	55.00	L-02
			Mazdoor	day	0.150	450.00	67.50	L-13
			b) Material					
			Aluminium alloy plate, 2 mm thick, fixed with high intensity grade sheeting vide clause 801.3	sqm	1.000	450.00	450.00	M-059
			Miscellaneous					
			Add 1 per cent of cost of labour for lifting arrangement, like ladders, pulleys, ropes etc				1.34	
			c) Overhead charges @ 8% on (a+b)				46.79	
			d) Contractor's profit @ 10% on (a+b+c)				63.16	
			Rate per sqm = (a+b+c+d)				694.78	
						say	695.00	
		Note	1. The cost of excavation and foundation concrete for fixing of vertical support system to be worked out separately as per the approved drawing/design and to be included in the estimate.					
			2. Lettering and arrow marks on sign board to be provided separately as per actual requirement. Rates for these items have been included separately in this chapter.					



CHAPTER-8								
TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES								
Sr No	Ref. to MoRTH Spec.		Description	Unit	Quantity	Rate Rs	Cost Rs	Remarks/ Input ref.



Sr No	Ref. to MoRTH Spec.	Description	Unit	Quantity	Rate Rs	Cost Rs	Remarks/ Input ref.
8.22	809	Reinforced Cement Concrete Crash Barrier					
		Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified					
		Unit = Linear metre					
		Taking output = 10 m					
		(i) a) M 40 grade concrete					
		M 40 grade concrete	cum	3.000	11992.30	35976.90	0.00
		b) Labour					
		Mate	day	0.040	550.00	22.00	0.00
		Mazdoor	day	1.000	450.00	450.00	0.00
		c) Material					
		HYSD steel reinforcement including dowel bars	tonne	0.280	77427.65	21679.74	0.00
		Pre-moulded asphalt filler board	sqm	0.320	1084.84	347.15	0.00
		d) Overhead charges @ on (b+c)				4678.06	
		e) Contractor's profit @ on (b+c+d)				6315.39	
		Cost for 10 metre = a+b+c+d+e				69469.24	
		Rate per metre = (a+b+c+d+e)/10				6946.92	
					say	6947.00	



Sr No	Ref. to MoRTH Spec.	Description	Unit	Quantity	Rate Rs	Cost Rs	Remarks/ Input ref.
14.18	2605	Filler joint					
		(i) Providing & fixing 2 mm thick corrugated copper plate in expansion joint complete as per drawing & Technical Specification.					
		Unit = Running meter					
		Taking output = 12 m					
		a) Labour					
		Cutting, bending, carrying & fixing etc.					
		Mate	day	0.04	550.00	22.00	L-12
		Mazdoor	day	0.50	400.00	200.00	L-13
		Mazdoor (Skilled)	day	0.50	450.00	225.00	L-15
		b) Material					
		Copper plate - 12m long x 250 mm wide	kg	55.00	325.45	17899.75	M-086
		Area = 12 x 0.25 = 3 sqm					
		Weight = 3 x 0.002 x 8900 = 53.4 kg					
		Wastage @ 2.5 per cent = 1.33 kg/54.73 kg say = 55 kg.					
		c) Overhead charges @ 0.25 on (a+b)				4586.69	
		d) Contractor's profit @ 0.1 on (a+b+c)				2293.34	
		Cost for 12 m = (a+b+c+d)				25226.78	
		Rate per m = (a+b+c+d)/12				2102.23	
					say	2102.00	
						2102.00	
14.18		(ii) Providing & fixing 20 mm thick compressible fibre board in expansion joint complete as per drawing & Technical Specification.					
		Unit = Running meter					
		Taking output = 12 m					
		a) Labour					
		For carrying, placing & fixing.					
		Mate	day	0.01	550.00	4.40	L-12
		Mazdoor	day	0.10	400.00	40.00	L-13
		Mazdoor (Skilled)	day	0.10	450.00	45.00	L-15
		b) Material					
		20 mm thick compressible fibre board 12 m long x 25 cm deep.	sqm	3.00	2042.05	6126.15	M-084
		Area = 12 x 0.25 = 3 sqm					
		c) Overhead charges @ 0.25 on (a+b)				1553.89	
		d) Contractor's profit @ 0.1 on (a+b+c)				776.94	
		Cost for 12 m = (a+b+c+d)				8546.38	
		Rate per m = (a+b+c+d)/12				712.20	
					say	712.00	
						712.00	
14.18		(iii) Providing and fixing in position 20 mm thick premoulded joint filler in expansion joint for fixed ends of simply supported spans not exceeding 10 m to cater for a horizontal movement upto 20 mm, covered with sealant complete as per drawing and technical specifications.					
		Unit = Running meter					
		Taking output = 12 m					
		a) Labour					
		Mate	day	0.01	550.00	5.50	L-12
		Mazdoor	day	0.20	400.00	80.00	L-13
		Mazdoor (Skilled)	day	0.10	450.00	45.00	L-15
		b) Material					
		Premoulded joint filler 12 m long, 20 mm thick and 300 mm deep.	sqm	3.60	516.12	1858.03	M-141
		c) Overhead charges @ 0.25 on (a+b)				497.13	
		d) Contractor's profit @ 0.1 on (a+b+c)				248.57	
		Cost for 12 m = (a+b+c+d)				2734.23	
		Rate per m = (a+b+c+d)/12				227.85	
					say	228.00	
						228.00	



Sr No	Ref. to MoRTH Spec.		Description	Unit	Quantity	Rate Rs	Cost Rs	Remarks/ Input ref.
14.18		(iv)	Providing and filling joint sealing compound as per drawings and technical specifications with coarse sand and 6 per cent bitumen by weight					
			<i>Unit = Running meter</i>					
			<i>Taking output = 12 m</i>					
			12m long x 100 mm wide x 10mm deep recess					
			a) Labour					
			Mate	day	0.02	550.00	11.00	L-12
			Mazdoor	day	0.50	400.00	200.00	L-13
			Mazdoor (Skilled)	day	0.10	450.00	45.00	L-15
			b) Material					
			Sand	cum	0.012	1612.00	19.34	M-005
			Volume $12 \times 0.1 \times 0.01 = 0.012$ cum					
			Weight $0.012 \times 1400 = 16.8$ kg					
			Bitumen	cum	0.001	42361.44	42.36	Schedule M-4 (xix)
			$16.8 \times 0.06 = 1$ kg					
			c) Overhead charges @ 0.25 on (a+b)				79.43	
			d) Contractor's profit @ 0.1 on (a+b+c)				39.71	
			Cost for 12 m = (a+b+c+d)				436.84	
			Rate per m = (a+b+c+d)/12				36.40	
						say	36.40	
							36.00	
		Note	For arriving at the final rate of filler joints per m length and per cm depth of joint filling compound, the rates at Sl. No. i), ii), iii) & iv) shall be added					



Ref. to MoRTH Spec.	Description	Unit	Quantity	Rate Rs	Cost Rs
Rate Analysis performed on basis of sample analysis published in "Guidebook for Fabrication & Erection of Steel Structures" by Alok Baishya, BE(Civil), MBA and published by Institute for Steel Development & Growth (INSDAG)	Supply, fabrication, delivery at bridge site and erection of structural steel works as per IS 2062, including two coats of primer, one at shop and the other at site and two coats of aluminium paints including all labour, material, consumables etc.				
	Unit =1MT				
	Taking output = 1MT				
	a) Material				
	Structural Steel	tonne	1.05	61092.77	64147.41
	Permanent Bolts of tested quality	kg	7.00	105.00	735.00
	Electrode (@10 kg of weld metal (approx 275 nos. of 4mm electrode / ton of fabrication)	nos.	275.00	9.35	2570.70
	Electrode (@2 kg of weld metal (approx 275 nos. of 4mm electrode / ton of erection)	nos.	50.00	9.35	467.40
	DA Gas for fabrication	cum	2.00	734.40	1468.80
	DA Gas for erection	cum	0.50	734.40	367.20
	Oxygen for fabrication	cum	6.00	126.84	761.04
	Oxygen for erection	cum	1.50	126.84	190.26
	Red Lead Primer for fabrication	l	1.50	160.27	240.41
	Red Lead Primer for erection	l	1.00	160.27	160.27
	Paint	l	2.00	191.44	382.88
	Service bolts for erection	kg	7.00	105.00	735.00
	b) Labour				
	Marker for fabrication	day	0.60	450.00	270.00
	Fitter-I for fabrication	day	0.90	550.00	495.00
	Gas Cutter for fabrication	day	0.90	450.00	405.00
	Hammer man	day	0.30	400.00	120.00
	Welder-I for fabrication	day	1.50	450.00	675.00
	Foreman for fabrication	day	0.90	450.00	405.00
	Grinder for fabrication	day	0.90	450.00	405.00
	Work Supervisor for fabrication	day	0.30	550.00	165.00
	Unskilled for fabrication	day	6.00	400.00	2400.00
	Painter for fabrication	day	1.52	550.00	836.00
	Painter for erection	day	5.05	550.00	2777.50
	Sarang for erection	day	1.00	450.00	450.00
	Riggers for erection	day	8.00	400.00	3200.00
	Welder for erection	day	1.00	450.00	450.00
	Gas Cutter for erection	day	1.00	450.00	450.00
	Fitter for erection	day	1.00	550.00	550.00
	Semi skilled for erection	day	3.00	350.00	1050.00
	c) Machinery				
	Welding machine, grinding machine for fabrication	LS		890.40	890.40
	Tools, Zigs and fixtures for fabrication	LS		254.40	254.40
	Crane, inch, Welding generator, rectifier, transformer, etc. for erection	LS		890.40	890.40
	Tools, tackles, safety appliances, etc for erection	LS		254.40	254.40
	d)Overheads @ 22.5% on (a+b+c)				20164.38
e)Contractor's profit @ 10% on (a+b+c+d)				10978.39	
Rate for per MT (a+b+c+d+e)				120762.24	
				120762.00	
			say		



Flexible Apron

Sr No	Ref. to MoRTH Spec.	Description	Unit	Quantity	Rate Rs	Cost Rs	Remarks/ Input ref.
15.11	2507.2	Flexible Apron :Construction of flexible apron 1 m thick comprising of loose stone boulders weighing not less than 40 kg beyond curtain wall.					
		Unit = cum					
		Taking Output = 1 cum					
		a) Material					
		Stone	cum	1.00	575.00	575.00	M-003
		Stone Spalls	cum	0.20	66.00	13.20	M-008
		b) Labour					
		Mate	day	0.05	450.00	22.50	L-12
		Mason	day	0.25	500.00	125.00	L-11
		Mazdoor	day	1.00	400.00	400.00	L-13
		Add 1 per cent of cost of (a+b) for trimming and preparation of bed.				11.36	
		c) Overhead charges @ 8% on (a+b)				91.76	
		d) Contractor's profit @ 10% on (a+b+c)				123.88	
		Rate per cum = (a+b+c+d)				1362.70	
					say	1363.00	



Approach Slab

Sr No	Ref. to MoRTH Spec.	Description	Unit	Quantity	Rate Rs	Cost Rs	Remarks / Input ref.
14.11	1500,1600,1700 & 2704	Reinforced cement concrete approach slab including reinforcement and formwork complete as per drawing and Technical specification					
		<i>Unit = 1 cum</i>					
		<i>Taking output = 1 cum</i>					
		a) Material					
		Cement concrete M30 Grade Refer relevant item of concrete in item 12.8(G) by using batching plant, excluding formwork i.e. per cum basic cost (a+b+c) (Excluding OH & CP)	cum	1.00	8235.60	8235.60	Item 12.8 (G)
		(Refer relevant item of concrete in item No. 13.8 (G) except that form work may be added at the rate of 2 per cent of cost against 3.5 per cent provided in the foundation concrete.				164.71	
		HYSD bar reinforcement Rate as per item No 14.2(Excluding OH & CP)	tonne	0.05	59458.22	2972.91	Item 14.2 A
		b) Overhead charges @ 22.5% on (a)				2558.97	
		c) Contractor's profit @ 10% on (a+b)				1393.22	
		Rate per cum (a+b+c)				15325.42	
					<i>say</i>	15325.00	
						15325.00	



BASES AND SURFACE COURSES (BITUMINOUS VG-40)

Sr No	Ref. to MoRTH Spec.	Description	Unit	Quantity	Rate Rs	Cost Rs	Remarks/ Input ref.
5.6	507	Dense Graded Bituminous Macadam					
		Providing and laying dense graded bituminous macadam with 100-120 TPH batch type HMP producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.0 to 4.5 per cent by weight of total mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in					
		Unit = cum					
		Taking output = 195 cum (450 tonnes)					
		a) Labour					
		Mate	day	0.840	550.00	462.00	L-12
		Mazdoor working with HMP, mechanical broom, paver, roller, asphalt cutter and assistance for setting out lines, levels and layout of construction	day	16.000	400.00	6400.00	L-13
		Skilled mazdoor for checking line & levels	day	5.000	450.00	2250.00	L-15
		b) Machinery					
		Batch mix HMP @ 75 tonne per hour	hour	6.000	49595.33	297572.00	P&M-022
		Paver finisher hydrostatic with sensor control @ 75 cum per hour	hour	6.000	6852.67	41116.00	P&M-034
		Generator 250 KVA	hour	6.000	3441.41	20648.44	P&M-081
		Front end loader 1 cum bucket capacity	hour	6.000	1755.33	10532.00	P&M-017
		Tipper 10 tonne capacity	tonne.km	450 x L	547.69	246459.54	Lead =1 km & P&M-058
		Add 10 per cent of cost of carriage to cover cost of loading and unloading				24645.95	
		smooth wheeled roller 8-10 tonnes for initial break down rolling.	hour	6.00x0.65*	1072.88	4184.25	P&M-044
		Vibratory roller 8 tonnes for intermediate rolling.	hour	6.00x0.65*	1743.33	6799.00	P&M-059
		Finish rolling with 6-8 tonnes smooth wheeled tandem roller.	hour	6.00x0.65*	1191.66	4647.47	P&M-045



		c) Materials					
		Bitumen @ 4.25 per cent of weight of mix	tonne	19.130	42361.44	810374.35	M-074
		Aggregate					
		Total weight of mix = 450 tonnes					
		Weight of bitumen = 19.13 tonnes					
		Weight of aggregate = 450 -19.13 = 430.87 tonnes					
		Taking density of aggregate = 1.5 ton/cum					
		Volume of aggregate = 287.25 cum					
		Grading - I (40 mm Nominal Size)					
		37.5 - 25 mm 22 per cent	cum	63.190	1214.45	76741.10	M-049
		25 - 10 mm 13 per cent	cum	37.340	1351.50	50464.92	M-046
		10 -4.75 mm 19 per cent	cum	54.580	1224.55	66835.94	M-040
		4.75 mm and below 44 per cent	cum	126.390	1174.20	148407.14	M-030
		Filler @ 2 per cent of weight of aggregates.	tonne	8.620	2653.22	22870.79	M-188
		or					
		Grading - II (19 mm Nominal Size)					
		25 - 10 mm 30 per cent	cum	86.160	1351.50	116445.02	M-046
		10 - 5 mm 28 per cent	cum	80.430	1224.55	98490.56	M-040
		5 mm and below 40 per cent	cum	114.900	1174.20	134915.58	M-030
		Filler @ 2 per cent of weight of aggregates.	tonne	8.620	2653.22	22870.79	M-188
		* Any one of the alternative may be adopted as per approved design					
		(i) For Grading I (40 mm nominal size)					
		d) Overhead charges @ 0.08 on (a+b+c)				147312.87	
		e) Contractor's profit @ 0.1 on (a+b+c+d)				198872.37	
		Cost for 205 cum = a+b+c+d+e				2187596.12	
		Rate per cum = (a+b+c+d+e)/195 (For Grading I)				11218.44	
						say	11218.00
		(ii) For GradingII(19 mm nominal size)					
		d) Overhead charges @ 0.08 on (a+b+c)				147905.04	
		e) Contractor's profit @ 0.1 on (a+b+c+d)				199671.80	
		Cost for 205 cum = a+b+c+d+e				2196389.78	
		Rate per cum = (a+b+c+d+e)/195 (For Grading-II)				11263.54	
						say	11264.00



		Note	*1. Although the roller are required only for 3 hours as per norms of output, but the same have to be available at site for six hours as the hot mix plant and paver will take six hours for mixing and paving the output of 450 tonnes considered in this analysis. To cater for the idle period of these rollers, their usage rates have been multiplied by a factor of 0.55.					
			2.Quantity of Bitumen has been taken for analysis purpose. The actual quantity will depend upon job mix formula.					
			3. Labour for traffic control, watch and ward and other miscellaneous duties at site including sundries have been included in administrative overheads of the contractor.					
			4. In case DBM is laid over freshly laid tack coat, provision of mechanical broom and 2 mazdoors shall be deleted as the same has been included in the cost of tack coat.					
			5. The individual density for each size of aggregates to be used for construction i.e. 37.5-25 mm, 25-10 mm etc. should be found in the laboratory and accordingly the quantities should be ammended for use in field. The average density of 1.5 tonne/cum is only a reference density in this Data Book.					
			6. The individual percentage of aggregates should be calculated from the total weight of dry aggregates i.e.. excluding the weight of bitumen. The weight of filler will also be 2 per cent by weight of dry aggregates.					



5.8	509	Bituminous Concrete					
		Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.4 to 5.6 per cent of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all					
		Unit = cum					
		Taking output = 191 cum (450 tonnes)					
		a) Labour					
		Mate	day	0.840	550.00	462.00	L-12
		Mazdoor working with HMP, mechanical broom, paver, roller, asphalt cutter and assistance for setting out lines, levels and layout of construction	day	16.000	400.00	6400.00	L-13
		Skilled mazdoor for checking line & levels	day	5.000	450.00	2250.00	L-15
		b) Machinery					
		Batch mix HMP @ 75 tonne per hour	hour	6.000	49595.33	297572.00	P&M-022
		Paver finisher hydrostatic with sensor control @ 75 cum per hour	hour	6.000	6852.67	41116.00	P&M-034
		Generator 250 KVA	hour	6.000	3441.41	20648.44	P&M-081
		Front end loader 1 cum bucket capacity	hour	6.000	1755.33	10532.00	P&M-017
		Tipper 10 tonne capacity	tonne.km	450 x L	547.69	246459.54	Lead =1 km & P&M-058
		Add 10 per cent of cost of carriage to cover cost of loading and unloading				24645.95	
		Smooth wheeled roller 8-10 tonnes for initial break down rolling.	hour	6.00x0.65*	1072.88	4184.25	P&M-044
		Vibratory roller 8 tonnes for intermediate rolling.	hour	6.00x0.65*	1743.33	6799.00	P&M-059
		Finish rolling with 6-8 tonnes smooth wheeled tandem roller.	hour	6.00x0.65*	1191.66	4647.47	P&M-045
		c) Material					
		i) Bitumen@ 5 per cent of weight of mix	tonne	22.500	42361.44	953132.40	M-074
		ii) Aggregate					
		Total weight of mix = 450 tonnes					
		Weight of bitumen = 22.5 tonnes					
		Weight of aggregate = 450 -22.50 = 427.50 tonnes					
		Taking density of aggregate = 1.5 ton/cum					
		Volume of aggregate = 285 cum					
		Grading - I (19 mm Nominal Size)					
		20 - 10 mm 35 per cent	cum	99.750	1399.51	139601.46	M-045
		10 - 5 mm 23 per cent	cum	65.550	1224.55	80269.25	M-040
		5 mm and below 40 per cent	cum	114.000	1174.20	133858.80	M-030
		Filler @ 2 per cent of weight of aggregates.	tonne	8.620	2653.22	22870.79	M-188
		or					
		Grading - II (13 mm Nominal Size)					
		13.2 - 10 mm 30 per cent	cum	85.500	1358.50	116151.75	M-044
		10 - 5 mm 25 per cent	cum	71.250	1224.55	87249.19	M-040
		5 mm and below 43 per cent	cum	122.550	1174.20	143898.21	M-030
		Filler @ 2 per cent of weight of aggregates.	tonne	8.620	2653.22	22870.79	M-188
		*Any one of the alternative may be adopted as per approved design					



	(i)	for Grading-I (19 mm nominal size)					
		d) Overhead charges @ 0.08 on (a+b+c)				159635.95	
		e) Contractor's profit @ 0.1 on (a+b+c+d)				215508.53	
		Cost for 205 cum = a+b+c+d+e				2370593.82	
		Rate per cum = (a+b+c+d+e)/191				12411.49	
					say	12411.00	
5.8	(ii)	for Grading-II(13 mm nominal size)					
		d) Overhead charges @ 0.08 on (a+b+c)				159121.52	
		e) Contractor's profit @ 0.1 on (a+b+c+d)				214814.05	
		Cost for 205 cum = a+b+c+d+e				2362954.55	
		Rate per cum = (a+b+c+d+e)/191 (For Grading-II)				12371.49	
					say	12371.00	
	Note	<p>*1. Although the rollers are required only for 3 hours as per norms of output, but the same have to be available at site for six hours as the hot mix plant and paver will take six hours for mixing and paving the output of 450 tonnes considered in this analysis. To cater for the idle period of these rollers, their usage rates have been multiplied by a factor of 0.65.</p> <p>2.Quantity of Bitumen has been taken for analysis purpose. The actual quantity will depend upon job mix formula.</p> <p>3. Labour for traffic control, watch and ward and other miscellaneous duties at site including sundries have been included in administrative overheads of the contractor.</p> <p>4. In case BC is laid over freshly laid tack coat, provision of mechanical broom and 2 mazdoors shall be deleted as the same has been included in the cost of tack coat.</p> <p>5. The individual density for each size of aggregates to be used for construction i.e. 37.5-25 mm, 25-10 mm etc. should be found in the laboratory and accordingly the quantities should be ammended for use in field. The average density of 1.5 tonne/cum is only a reference density in this Data Book.</p> <p>6. The individual percentage of aggregates should be calculated from the total weight of dry aggregates i.e.. excluding the weight of bitumen. The weight of filler will also be 2 per cent by weight of dry aggregates.</p>					



CHAPTER-9

PIPE CULVERTS

Sr No	to MoRTH Spec.	Description	Unit	Quantity	Rate Rs	Cost Rs
9.2	2900	Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row .				
		Laying Reinforced cement concrete pipe NP4/prestressed concrete pipe for culverts on first class bedding of granular material in single row including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head walls and parapets .				
		<i>Unit = metre</i>				
		<i>Taking output = 12.5 metres (5 pipes of 2.5 m length each)</i>				
9.2	B	1200 mm dia				
		a) Labour				
		Mate	day	0.280	550.00	154.00
		Mason	day	1.000	400.00	400.00
		Mazdoor	day	6.000	450.00	2700.00
		b) Material				
		Sand at site	cum	0.090	1612.00	145.08
		Cement at site	tonne	0.070	9830.60	688.14
		RCC pipe NP-4/prestressed concrete pipe including collar	metre	12.500	8970.00	112125.00
		Granular material passing 5-6 mm sieve for class bedding	cum	5.000	1174.20	5871.00
		c) Overhead charges @ on (a+b)				9766.66
		d) Contractor's profit @ on (a+b+c)				13184.99
		Cost for 12.5 metres = a+b+c+d				145034.87
		Rate per metre= (a+b+c+d)/12.5				11602.79
					say	11603.00
		Note				
		1. In case of cement craddle bedding, quantity of PCC M15 is to be calculated as per design and priced separately and added .				
		2. The rate analysis does not include excavation, cement /masonry works in head walls, backfilling, protection works and parapet walls. The same are to be calculated as per approved design and drawings and priced separately on rates available under respective sections				



CHAPTER - 4

SUB-BASES, BASES (NON- BITUMINOUS) AND SHOULDERS

Sr No	Ref. to MoRTH Spec.	Description	Unit	Quantity	Rate Rs	Cost Rs
4.1	401	Granular Sub-Base with Close Graded Material (Table:- 400-1)				
	A	Plant Mix Method				
		Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401				
		Unit = cum				
		Taking output = 225 cum (450 tonne)				
		a) Labour				
		Mate	day	0.400	550.00	220.00
		Mazdoor skilled	day	2.000	450.00	900.00
		Mazdoor	day	8.000	400.00	3200.00
		b) Machinery				
		Wet mix plant @ 75 tonne capacity per hour	hour	6.000	5362.58	32175.50
		Electric generator 125 KVA	hour	6.000	2202.50	13215.00
		Water tanker 6 KL capacity 5 km lead with one trip per hour	hour	4.500	992.33	4465.50
		Front end loader 1 cum bucket capacity	hour	6.000	1755.33	10532.00
		Tipper 10 tonne (taking Lead, L= 2km)	tonne.km	450 x L	63.90	57507.23
		Add 10 per cent of cost of carriage to cover loading and unloading				5750.72
		Motor Grader 110 HP	hour	6.000	5049.17	30295.00
		Vibratory roller 8-10 t	hour	6.000	1743.33	10460.00
		c) Material				
		Close graded Granular sub-base Material as per table 400-1				
		For Grading-V Material				
		53 mm to 9.5 mm @ 50 per cent	cum	144.000	1325.49	190870.27
		9.5 mm to 2.36 mm @ 20 per cent	cum	57.000	1224.55	69799.35
		2.36 mm below @ 30 per cent	cum	86.400	1560.72	134846.21
		Cost of water	KL	27.000	125.00	3375.00
4.1A	(i)	Rate per cum for grading-V Material				
		d) Overhead charges @ on (a+b+c)				45408.94
		e) Contractor's profit @ on (a+b+c+d)				61302.07
		Cost for 225 cum = a+b+c+d+e				674322.79
		Rate per cum = (a+b+c+d+e)/225				2996.99
					say	2997.00
	Note	Any one of the grading for material may be adopted as per design				



8.38	Sug ges tive	Rumble Strips				
		Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint.				
		Unit = sqm				
		Taking output = 1 sqm (including gaps)				
		The rate per sqm of premix carpet and road marking may be adopted				
6.1	511	Open - Graded Premix Surfacing By Manual Method				222.54
8.14		Road Marking With Hot Applied Thermo Plastic Compound				1002.44
		Rate per sqm =				1224.98



VOLUME VII
COST ESTIMATE



ABSTRACT OF COST



Road name- IMPHAL-JIRIBAM ROAD SECTION OF NH-53 (OLD NH-37)
PKG-II
(FROM DESIGN CH KM 15+940 TO KM 33+120)
GENERAL ABSTRACT OF COST

Length of Road (KM) : 17.180

DESCRIPTION OF WORKS		TOTAL COST (IN Cr.)	COST PER KM. OF TOTAL ROAD LENGTH (IN Cr.)	% of Cost of Civil Works (% of C)
A.	ROAD WORKS			
1	Site Clearance and Dismantling	1.91	0.11	1.34%
2	Earth work ,Subgrade and Erosion control	10.93	0.64	7.69%
3	Sub-Base & Base	34.81	2.03	24.51%
4	Bituminous Courses	29.78	1.73	20.96%
5	Junction Improvement	0.29	0.02	0.20%
6	Traffic signs, Road marking & other road appurtenances	3.32	0.19	2.34%
7	Passenger Shelter	0.12	0.01	0.08%
8	Busbay	0.89	0.05	0.63%
	Drainage and Protective Works			
9	Longitudinal Drains	11.38	0.66	8.01%
10	Retaining wall	2.96	0.17	2.08%
11	Breast wall	12.86	0.75	9.05%
B.	BRIDGES & CULVERTS			
12	Culvert	23.46	1.37	16.52%
13	Minor Bridge	5.20	0.30	3.66%
C.	COST OF CIVIL WORKS IN LAKHS (AS PER SOR 2018)	137.91	8.03	
D.	Escalation @ 3% WPI	4.14		
E.	Total Civil Cost including Escalation@3%	142.05	8.27	
F.	Maintenance for 5 years, i.e 2.5% on civil cost (E)	3.55		
G.	GST @ 12% of (E)	17.05		
H.	Contingencies @ 2.8% over Civil Cost (E)	3.98		
I.	Supervision Charges @ 3% of (E)	4.26		
J.	Agency Charges @3% of (E)	4.26		
K	Escalation Cost @ 2.5% during Construction Period(For 1.5 Yrs of construction period, No escalation in 1st Year and 2.5% for 0.5 Years)	3.55		
L.	TOTAL CONSTRUCTION COST (C+D+E+F+G+H+I)=J	178.70	10.40	
M.	DEPARTMENTAL COST			
a.	LA Cost	11.31		
b.	Encroachment Demolition Cost	2.84		
c.	Utility Shifting(Electrical+PHE)	2.13		
d.	Environmental Budget	3.00		
N	Sub Total (L)	19.28		
O	TOTAL PROJECT COST (N+M)=O	197.98	11.52	



BILL
(ROAD PART)



Summary of Bill of Quantity

Bill No : 01. Site Clearance and Dismantling

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	02.01/i	Cutting of Girth 300-600mm	Each	5.00	392.30	1,962
2	02.01/ii	Cutting of Girth 600-900mm	Each	22.00	723.48	15,917
3	02.01/iii	Cutting of Girth 900-1800mm	Each	118.00	1,373.64	162,090
4	02.01/iv	Cutting of Girth 1800-2700mm	Each	23.00	2,576.19	59,252
5	02.01/v	Cutting of Girth 2700mm more	Each	23.00	4,330.68	99,606
6	02.03/b	Clearing & grubbing(Mechanical - Light Jungle)	Ha	29.28	59,912.85	1,754,248
7	02.04/i/c	Dismantling Structure RCC	cum	126.00	1,756.40	221,306
8	02.04/iii/b	Dismantling Structure Rubble Stone Masonry Cement	Cum	1,656.00	494.21	818,412
9	02.04/vii/a	Mortar Dismantle HP (300-600)	rm	30.00	267.64	8,029
10	02.04/vii/b	Dismantle HP (upto 600 - 900 mm dia)	rm	340.00	362.36	123,202
11	02.04/vii/c	Dismantle HP (above 900 mm dia)	rm	60.00	620.22	37,213
12	02.04/viii/e	Dismantle Flexible Pavement Granular	sqm	185,655.00	34.33	6,373,536
13	02.04/viii/f/ii	Dismantle Flexible Pavement Bituminous(Roller & Scarifier)	sqm	163,400.00	57.65	9,420,010
Total of Bill						19,094,783

Bill No : 02. Earth work,Subgrade and Erosion control

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	03.13	Embankment fill from Roadway Cutting	cum	47,996.00	161.80	7,765,753
2	03.14	Subgrade and Earthen Shoulder Fill From Borrow Pit	cum	54,967.23	315.46	17,339,964
3	03.31	Excavation in Hill in Soil For Roadway	cum	289,843.20	213.50	61,881,523
4	03.32	Excavation for Roadway Ordinary Rock Mechanical (Without Blasting)	cum	72,460.80	307.61	22,289,667
Total of Bill						109,276,906

Bill No : 03. Sub-Base & Base Courses

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	04.01/Nsc1	GSB Close Graded GR V	Cum	28,354.39	4,232.85	120,019,892
2	04/nsc1	GSB Reuse	Cum	16,368.63	2,083.63	34,106,158
3	05.02	WMM	Cum	45,653.84	4,248.35	193,953,508
Total of Bill						348,079,559

Summary of Bill of Quantity

Bill No : 04. Bituminous Courses

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	06.01/a	Prime Coat	sqm	179,603.00	58.45	10,497,795
2	06.02/ii	Tack Coat(Granular Layer)	sqm	170,362.00	17.45	2,972,817
3	06/Nsc1	DBM GR II	cum	14,368.24	12,809.83	184,054,712
4	06/Nsc2	BC GR II	cum	7,184.12	13,951.50	100,229,250
Total of Bill						297,754,574

Bill No : 05. Junction Improvement (Major & Minor)

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	04.01/Nsc1	GSB Close Graded GR V	Cum	106.77	4,232.85	451,924
2	04/nsc1	GSB Reuse	Cum	61.63	2,083.63	128,422
3	05.02	WMM	Cum	210.50	4,248.35	894,278
4	06.01/a	Prime Coat	sqm	842.00	58.45	49,215
5	06.02/i	Tack Coat(Bituminous Layer)	sqm	842.00	15.88	13,371
6	06/Nsc1	DBM GR II	cum	67.36	12,809.83	862,870
7	06/Nsc2	BC GR II	cum	33.68	13,951.50	469,887
Total of Bill						2,869,967

Bill No : 06. Traffic signs, Road marking & other road appurtenances

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	08.02/a	5 th km Stone	each	3.00	5,158.29	15,475
2	08.02/b	Ordinary km Stone	each	14.00	3,083.99	43,176
3	08.04	Boundary Stone	each	174.00	2,519.10	438,323
4	08.11/i	90 cm equilateral triangle	each	274.00	5,620.83	1,540,107
5	08.11/iii	60 cm circular	each	66.00	5,125.38	338,275
6	08.11/iv	80 cm x 60 cm rectangular	each	6.00	6,403.46	38,421
7	08.11/vii	90 cm high octagon	each	17.00	8,887.07	151,080
8	08.14	Paint on Bituminous Surface	sqm	5,644.33	1,012.16	5,712,969
9	08.15/c/v	Road Delineators(100 cm long above Road)	each	2,005.00	1,073.82	2,153,009
10	08.18/A/b	Type-A, "W" Metal Beam Crash Barrier	Rm	3,545.00	3,367.42	11,937,504
11	08.20/ii	Road Stud/Road Markers	nos	9,726.00	387.48	3,768,630
12	08.22	Lighting on Bridges	nos	53.00	21,376.67	1,132,964
13	08/nsc/2	Convex Mirror for Blind Curve	nos	36.00	5,050.00	181,800

Summary of Bill of Quantity

Bill No : 06. Traffic signs, Road marking & other road appurtenances

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
14	08/nsc/6	Rumble Strip	sqm	580.00	1,237.23	717,593
15	16.09	Protection Work Steel Railing	Rm	1,092.00	4,625.43	5,050,970
Total of Bill						33,220,297

Bill No : 07. Passenger Shelter

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	08.05	Paint on Concrete Surface(2 Coat)	sqm	396.41	94.34	37,397
2	10.16	Sub Structure Plaster with 1:3 Cement Morter	sqm	396.41	225.72	89,477
3	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	59.45	221.12	13,146
4	14.01	Foundation Brick Work C.M. 1:3	cum	9.11	11,968.37	109,068
5	14.03/a	Foundation PCC M15	cum	6.04	9,823.96	59,317
6	14.03/e/II	Foundation RCC M25	cum	4.16	10,646.05	44,320
7	14.08	Foundation Steel (HYSD)	MT	0.50	78,704.35	39,352
8	14/nsc2	Brick Flat Soling	Sqm	80.63	1,129.07	91,031
9	15.01	Sub Structure Brick Work	cum	19.43	12,081.21	234,774
10	16.01/a/i	Super Structure RCC M25 - Solid Slab Super	cum	24.91	12,025.96	299,555
11	16.03	Structure(Upto 5m) Super Structure Steel(HYSD)	MT	2.49	86,538.12	215,566
Total of Bill						1,233,002

Bill No : 08. Bus Bay

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	03.14/Nsc	Subgrade and Earthen Shoulder Fill From Roadway	cum	1,062.00	248.74	264,162
2	04.01/Nsc1	Cutting GSB Close Graded GR V	Cum	269.32	4,232.85	1,140,004
3	04/nsc1	GSB Reuse	Cum	155.48	2,083.63	323,957
4	05.02	WMM	Cum	531.00	4,248.35	2,255,874
5	05.03	Foothpath Area	sqm	885.00	1,626.63	1,439,568
6	06.01/a	Prime Coat	sqm	2,124.00	58.45	124,148
7	06.02/i	Tack Coat(Bituminous Layer)	sqm	2,124.00	15.88	33,729
8	06/Nsc1	DBM GR II	cum	169.92	12,809.83	2,176,646
9	06/Nsc2	BC GR II	cum	84.96	13,951.50	1,185,319
Total of Bill						8,943,406

Summary of Bill of Quantity

Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	24,726.37	221.12	5,467,495
2	14.02/b	Foundation Random Rubble Masonry (coursed/uncoursed) Cement Morter(1:3)	cum	7,843.73	7,837.05	61,471,673
3	14.03/a	Foundation PCC M15	cum	481.46	9,823.96	4,729,795
4	14.03/b	Foundation PCC M20	cum	63.47	10,890.76	691,237
5	15.02/b	Sub Structure Random Rubble Masonry Cement Morter(1:3)	cum	867.34	8,323.36	7,219,191
6	15.03/b/i	Sub Structure PCC M20	cum	147.14	10,604.44	1,560,284
7	15.03/f/i	Sub Structure RCC M25 (Upto 5m)	cum	2,077.05	11,512.30	23,911,577
8	15.05	Sub Structure Steel (HYSD)	MT	103.85	78,704.35	8,173,604
9	15.12	Sub Structure Weepholes per Meter	Rm	1,236.50	452.35	559,331
10	24/i/b	MS Hook(300gm each)	kg	197.52	121.20	23,939
11	40	Geotextile filter(75mm sqm)	sqm	222.21	25.76	5,724
Total of Bill						113,813,850

Bill No : 10. Retaining wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	1,715.02	221.12	379,225
2	13.01/b/ii	Foundation Earthwork Ordinary Rock(0-3m)	cum	428.76	211.31	90,600
3	13.04	Sub Structure Filter Media	cum	1,463.24	2,426.81	3,551,005
4	14.02/b	Foundation Random Rubble Masonry (coursed/uncoursed) Cement Morter(1:3)	cum	921.10	7,837.05	7,218,699
5	14.03/a	Foundation PCC M15	cum	524.15	9,823.96	5,149,189
6	15.02/b	Sub Structure Random Rubble Masonry Cement Morter(1:3)	cum	1,287.09	8,323.36	10,712,922
7	15.03/b/i	Sub Structure PCC M20	cum	144.44	10,604.44	1,531,684
8	15.12	Sub Structure Weepholes per Meter	Rm	2,206.00	452.35	997,884
Total of Bill						29,631,209

Bill No : 11. Breast wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	10,108.76	221.12	2,235,249
2	13.01/b/ii	Foundation Earthwork Ordinary Rock(0-3m)	cum	2,527.19	211.31	534,020
3	13.03/a	Sub Structure Backfill Granular Material	cum	1,767.93	2,157.35	3,814,044

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)

Summary of Bill of Quantity

Bill No : 11. Breast wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
4	13.03/b	Sub Structure Backfill Sandy Material	cum	513.27	1,762.60	904,690
5	14.02/b	Foundation Random Rubble Masonry (coursed/uncoursed) Cement Morter(1:3)	cum	4,749.80	7,837.05	37,224,428
6	14.03/a	Foundation PCC M15	cum	2,204.78	9,823.96	21,659,671
7	15.02/b	Sub Structure Random Rubble Masonry Cement Morter(1:3)	cum	7,268.16	8,323.36	60,495,487
8	15.12	Sub Structure Weepholes per Meter	Rm	3,770.32	452.35	1,705,503
Total of Bill						128,573,091

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



Bill No : 01. Site Clearance and Dismantling

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	02.01/i	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth from 300 mm to 600 mm	Each	5.00	392.30	1,961.50
2	02.01/ii	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 600 mm to 900 mm	Each	22.00	723.48	15,916.56
3	02.01/iii	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 900 mm to 1800 mm	Each	118.00	1373.64	162,089.52
4	02.01/iv	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 1800 mm to 2700 mm	Each	23.00	2576.19	59,252.37
5	02.01/v	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 2700 mm	Each	23.00	4330.68	99,605.64
6	02.03/b	Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by mechanical means)	Ha	29.28	59912.85	1,754,248.25



Bill No : 01. Site Clearance and Dismantling

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
7	02.04/i/c	Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above	cum	126.00	1756.40	221,306.40
8	02.04/iii/b	Dismantling stone masonry b) Rubble stone masonry in cement mortar	Cum	1,656.00	494.21	818,411.76
9	02.04/vii/a	Removing hume pipes class NP-3 a) 300mm to 600mm dia	rm	30.00	267.64	8,029.20
10	02.04/vii/b	Removing hume pipes class NP-4 b) Above 600mm to 900mm dia	rm	340.00	362.36	123,202.40
11	02.04/vii/c	Removing hume pipes class NP-5 c) Above 900mm dia	rm	60.00	620.22	37,213.20
12	02.04/viii/e	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m e)Kandar/Gravel metal crust upto 150 mm thick with power Roller with scarifier	sqm	185,655.00	34.33	6,373,536.15
13	02.04/viii/f/ii	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base ii)With road roller attached with scarifier	sqm	163,400.00	57.65	9,420,010.00
Total of Bill 01. Site Clearance and Dismantling						19,094,782.95

Item Rate Analysis has been done considering



Bill No : 02. Earth work,Subgrade and Erosion control

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	03.13	Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2	cum	47,996.00	161.80	7,765,752.80
2	03.14	Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2	cum	54,967.23	315.46	17,339,963.64
3	03.31	Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres	cum	289,843.20	213.50	61,881,523.20
4	03.32	Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting. Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres	cum	72,460.80	307.61	22,289,666.69
Total of Bill 02. Earth work,Subgrade and Erosion control						109,276,906.33



Bill No : 03. Sub-Base & Base Courses

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	04.01/Ns c1	Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material	Cum	28,354.39	4232.85	120,019,892.41
2	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401	Cum	16,368.63	2083.63	34,106,158.11
3	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)	Cum	45,653.84	4248.35	193,953,508.16
Total of Bill 03. Sub-Base & Base Courses						348,079,558.68

Bill No : 04. Bituminous Courses

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm	sqm	179,603.00	58.45	10,497,795.35
2	06.02/ii	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. ii) On granular Surface Pre treated with prime Coat @ 0.25 - 0.30 kg/sqm	sqm	170,362.00	17.45	2,972,816.90
3	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40	cum	14,368.24	12809.83	184,054,711.80



Bill No : 04. Bituminous Courses

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
4	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	7,184.12	13951.50	100,229,250.18
Total of Bill 04. Bituminous Courses						297,754,574.23



Bill No : 05. Junction Improvement (Major & Minor)

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	04.01/Ns c1	Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material	Cum	106.77	4232.85	451,924.46
2	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401	Cum	61.63	2083.63	128,422.45
3	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)	Cum	210.50	4248.35	894,277.68
4	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm	sqm	842.00	58.45	49,214.90



Bill No : 05. Junction Improvement (Major & Minor)

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
5	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm	sqm	842.00	15.88	13,370.96
6	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40	cum	67.36	12809.83	862,870.15
7	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	33.68	13951.50	469,886.52
Total of Bill 05. Junction Improvement (Major & Minor)						2,869,967.12



Bill No : 06. Traffic signs, Road marking & other road appurtenances

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	08.02/a	Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. a) 5th KM stone	each	3.00	5158.29	15,474.87
2	08.02/b	Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. b) Ordinary kilometer stone	each	14.00	3083.99	43,175.86
3	08.04	Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting	each	174.00	2519.10	438,323.40
4	08.11/i	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm equilateral triangle	each	274.00	5620.83	1,540,107.42
5	08.11/iii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm circular	each	66.00	5125.38	338,275.08

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



Bill No : 06. Traffic signs, Road marking & other road appurtenances

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
6	08.11/iv	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 80 mm x 60 mm rectangular	each	6.00	6403.46	38,420.76
7	08.11/vii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm high octagon	each	17.00	8887.07	151,080.19
8	08.14	Road Marking with Hot Applied Thermoplastic Compound with Reflectorisng Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorisng glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.)	sqm	5,644.33	1012.16	5,712,969.10



Bill No : 06. Traffic signs, Road marking & other road appurtenances

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
9	08.15/c/v	Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming to IRC-79 and the drawings.) 120x120 -Road Delineator	each	2,005.00	1073.82	2,153,009.10
10	08.18/A/b	Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.5 m	Rm	3,545.00	3367.42	11,937,503.90
11	08.20/ii	Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973 Light Reflecting Lense Type	nos	9,726.00	387.48	3,768,630.48
12	08.22	Lighting on Bridges Providing & fixing lighting on Bridges, mounted on steel hollow circular poles of standard specification, 5 m high fixed on parapets with cement concrete, 20 m apart and fitted with sodium vapour lamp	nos	53.00	21376.67	1,132,963.51



Bill No : 06. Traffic signs, Road marking & other road appurtenances

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
13	08/nsc/2	Convex Mirror For Blind Curve	nos	36.00	5050.00	181,800.00
14	08/nsc/6	Rumble Strips Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint.	sqm	580.00	1237.23	717,593.40
15	16.09	Mild steel railing complete as per drawing and Technical Specifications	Rm	1,092.00	4625.43	5,050,969.56
Total of Bill 06. Traffic signs, Road marking & other road appurtenances						33,220,296.63



Bill No : 07. Passenger Shelter

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	396.41	94.34	37,396.85
2	10.16	Cement Plaster 12mm Thick in Cement Morter 1:3	sqm	396.41	225.72	89,476.54
3	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	59.45	221.12	13,145.58
4	14.01	Brick masonry work in cement mortar 1:3 in foundation complete excluding pointing and plastering, as per drawing and technical specifications	cum	9.11	11968.37	109,067.76
5	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	6.04	9823.96	59,317.07
6	14.03/e/l	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M25Grade	cum	4.16	10646.05	44,319.51
7	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification	MT	0.50	78704.35	39,352.18
8	14/nsc2	Brick Flat Soling at Foundation	Sqm	80.63	1129.07	91,031.27
9	15.01	Brick masonry work in cement mortar 1:3 in Sub-structure complete excluding pointing and plastering, as per drawing and technical specifications				

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



Bill No : 07. Passenger Shelter

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			cum	19.43	12081.21	234,774.15
10	16.01/a/i	cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complete as per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m	cum	24.91	12025.96	299,554.64
11	16.03	HYSD bar reinforcement in super-structure complete as per drawing and technical specifications	MT	2.49	86538.12	215,566.46
Total of Bill 07. Passenger Shelter						1,233,001.99



Bill No : 08. Bus Bay

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	03.14/Nsc	Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from Roadway Cutting with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2	cum	1,062.00	248.74	264,161.88
2	04.01/Nsc1	Sub-base with Close Graded Material (Table:-400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material	Cum	269.32	4232.85	1,140,003.86
3	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401	Cum	155.48	2083.63	323,956.54
4	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)	Cum	531.00	4248.35	2,255,873.85

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



Bill No : 08. Bus Bay

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
5	05.03	Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar including provision of all drainage arrangements but excluding kerb channel.	sqm	885.00	1626.63	1,439,567.55
6	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm	sqm	2,124.00	58.45	124,147.80
7	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm	sqm	2,124.00	15.88	33,729.12
8	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40	cum	169.92	12809.83	2,176,646.31



Bill No : 08. Bus Bay

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
9	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	84.96	13951.50	1,185,319.44
Total of Bill 08. Bus Bay						8,943,406.36



Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	24,726.37	221.12	5,467,494.71
2	14.02/b	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	7,843.73	7837.05	61,471,672.85
3	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	481.46	9823.96	4,729,794.66
4	14.03/b	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M20 Grade	cum	63.47	10890.76	691,236.54
5	15.02/b	Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	867.34	8323.36	7,219,191.39
6	15.03/b/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m	cum	147.14	10604.44	1,560,284.28
7	15.03/f/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height	cum	2,077.05	11512.30	23,911,576.67

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
8	15.05	HYSB bar reinforcement in Sub-structure complete as per drawing and technical specification	MT	103.85	78704.35	8,173,604.16
9	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	1,236.50	452.35	559,330.78
10	24/i/b	Galvanised Mild steel J /L hook	kg	197.52	121.20	23,939.42
11	40	Gextextile material (fine net)	sqm	222.21	25.76	5,724.13
Total of Bill 09. Longitudinal Drains						113,813,849.58

Item Rate Analysis has been done considering



Bill No : 10. Retaining wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	1,715.02	221.12	379,225.00
2	13.01/b/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to	cum	428.76	211.31	90,600.22
3	13.04	Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification .	cum	1,463.24	2426.81	3,551,005.46
4	14.02/b	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	921.10	7837.05	7,218,698.92
5	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	524.15	9823.96	5,149,189.34
6	15.02/b	Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	1,287.09	8323.36	10,712,921.75
7	15.03/b/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m	cum	144.44	10604.44	1,531,684.10
8	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications				

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



Bill No : 10. Retaining wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			Rm	2,206.00	452.35	997,884.10
Total of Bill 10. Retaining wall						29,631,208.89

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



Bill No : 11. Breast wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	10,108.76	221.12	2,235,248.57
2	13.01/b/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to	cum	2,527.19	211.31	534,020.31
3	13.03/a	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials	cum	1,767.93	2157.35	3,814,043.79
4	13.03/b	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material	cum	513.27	1762.60	904,689.70
5	14.02/b	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	4,749.80	7837.05	37,224,427.93
6	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	2,204.78	9823.96	21,659,670.53
7	15.02/b	Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	7,268.16	8323.36	60,495,487.25
8	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	3,770.32	452.35	1,705,502.89

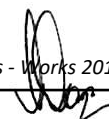
Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)

		Total of Bill	11. Breast wall	128,573,090.96
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Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



BILL
(STRUCTURE PART)



Summary of Bill of Quantity

Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
Foundation						
1	10.20	Foundation Culvert PCC M15	cum	1,454.00	8,963.58	13,033,045
2	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	10,984.00	221.12	2,428,782
End of Sub Total Foundation						15,461,827
Sub Structure						
3	10.06/a	Steel culvert for Sub-Structure	Ton	661.00	74,215.85	49,056,677
4	10.20/b	Culvert Backfilling culvert by Gravelly materials	cum	4,189.00	2,325.46	9,741,352
5	10.20/c	Filter Media culvert behind abutment, wing and return wall	cum	5,864.00	2,308.26	13,535,637
6	15.03/f/i	Sub Structure RCC M25 (Upto 5m)	cum	8,261.00	11,512.30	95,103,110
7	15.12	Sub Structure Weepholes per Meter	Rm	2,821.00	452.35	1,276,079
End of Sub Total Sub Structure						168,712,855
Super Structure						
8	06.02/i	Tack Coat(Bituminous Layer)	sqm	2,139.00	15.88	33,967
9	06/Nsc2	BC GR II	cum	86.00	13,951.50	1,199,829
10	08.05	Paint on Concrete Surface(2 Coat)	sqm	1,100.00	94.34	103,774
11	08/nsc/5	Crash Barrier RCC M40	m	430.00	6,996.27	3,008,396
12	10.06/b	Steel culvert for Super-Structure	Ton	96.00	74,215.85	7,124,722
13	16.01/a/i	Super Structure RCC M25 - Solid Slab Super Structure(Upto 5m)	cum	1,194.00	12,025.96	14,358,996
14	16.11	Super Structure Drainage Spout	each	134.00	2,182.50	292,455
15	16.17	Super Structure Mastic Asphalt	sqm	2,139.00	554.06	1,185,134
End of Sub Total Super Structure						27,307,274
Protection Work						
16	10.19	Stone Pitching Culvert	cum	563.00	4,780.11	2,691,202
17	13.01/a/i/Nsc	Excavation For Protection work	cum	3,357.00	221.12	742,300
18	16/nsc	Protection Work Curtain Wall- PCC (M-15)	cum	1,851.00	10,604.44	19,628,818
End of Sub Total Protection Work						23,062,320
Miscellaneous Work						
19	08.05	Paint on Concrete Surface(2 Coat)	sqm	1,100.00	94.34	103,774
End of Sub Total Miscellaneous Work						103,774
Total						234,648,050

Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
Foundation						

Summary of Bill of Quantity

Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
1	13.01/a/i	Foundation Earthwork Ordinary Soil (0 -3m)	cum	2,306.05	221.12	509,913
2	13.01/a/ii	Foundation Earthwork Ordinary Soil (3m-6m)	cum	267.00	297.22	79,358
3	14.03/a	Foundation PCC M15	cum	104.00	9,823.96	1,021,692
4	14.03/g	Foundation RCC M30	cum	334.00	12,515.91	4,180,314
5	14.08	Foundation Steel (HYSD)	MT	40.00	78,704.35	3,148,174
End of Sub Total Foundation						8,939,451
Sub Structure						
6	13.03/a	Sub Structure Backfill Granular Material	cum	132.00	2,157.35	284,770
7	13.03/b	Sub Structure Backfill Sandy Material	cum	2,891.00	1,762.60	5,095,677
8	13.04	Sub Structure Filter Media	cum	404.00	2,426.81	980,431
9	15.03/g/i	Sub Structure RCC M30 (Upto 5m)	cum	534.00	13,380.53	7,145,203
10	15.03/h/i	Sub Structure RCC M35 (Upto 5m)	cum	26.00	12,095.47	314,482
11	15.05	Sub Structure Steel (HYSD)	MT	75.00	78,704.35	5,902,826
12	15.12	Sub Structure Weepholes per Meter	Rm	598.00	452.35	270,505
End of Sub Total Sub Structure						19,993,895
Super Structure						
13	06.02/i	Tack Coat(Bituminous Layer)	sqm	408.00	15.88	6,479
14	06/Nsc2	BC GR II	cum	60.00	13,951.50	837,090
15	14/nsc1/i	Super Structure Filler (Copper Plate)	m	48.00	2,080.60	99,869
16	14/nsc1/ii	Super Structure Filler (Fibre Board)	m	48.00	704.98	33,839
17	14/nsc1/iii	Super Structure Filler (Premoulder Joint)	m	48.00	225.23	10,811
18	14/nsc1/iv	Super Structure Filler (Sealing Compound)	m	48.00	36.36	1,745
19	16.01/b/i/c2/i	Super Structure RCC M30 (T Beam & Slab)	cum	226.00	13,420.02	3,032,925
20	16.03	Super Structure Steel(HYSD)	MT	41.00	86,538.12	3,548,063
21	16.05	Cement concrete wearing coat M30	cum	3.00	20,410.52	61,232
22	16.08	Protection Work RCC Railing M30 (In situ	Rm	74.00	2,873.87	212,666
23	16.11	20mm Aggregate)				
24	16.12/Nsc	Super Structure Drainage Spout	each	8.00	2,182.50	17,460
25	16.13	Super Structure Approach Slab (M30)	cum	58.00	17,453.91	1,012,327
26	16.17	Super Structure PCC M15 Levelling Course	cum	22.00	9,604.60	211,301
27	16.17	Below Approach Slab				
28	16.17	Super Structure Mastic Asphalt	sqm	408.00	554.06	226,056
End of Sub Total Super Structure						9,311,863
Protection Work						
27	08/nsc/5	Crash Barrier RCC M40	m	74.00	6,996.27	517,724
28	16/nsc	Protection Work Curtain Wall- PCC (M-15)	cum	41.00	10,604.44	434,782

Summary of Bill of Quantity

Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate	Cost
29	17.01/a	Protection Work Boulder Apron Laid in Wire Crates	cum	59.00	5,364.39	316,499
30	17.02	Protection Work Filter material underneath pitching in slopes	cum	30.00	3,590.63	107,719
31	17.03/a	Protection Work Pitching on slopes laid over prepared filter media(Stone)	cum	61.00	4,733.55	288,747
End of Sub Total Protection Work						1,665,470
Miscellaneous Work						
32	02.04/i/c	Dismantling Structure RCC	cum	1,199.00	1,756.40	2,105,924
33	08.05	Paint on Concrete Surface(2 Coat)	sqm	508.00	94.34	47,925
34	08.12	Direction Sign(<.0.9 sqm)	sqm	4.00	12,543.94	50,176
35	13/nsc1	Confirmatory Boring in soil	cum	12.00	2,020.00	24,240
36	13/nsc2	Confirmatory Boring in Hard Rock	cum	20.00	4,040.00	80,800
End of Sub Total Miscellaneous Work						2,309,064
Diversion Work						
37	03.13	Embankment fill from Roadway Cutting	cum	6,400.00	161.80	1,035,520
38	03.31	Excavation in Hill in Soil For Roadway	cum	7,200.00	213.50	1,537,200
39	04.01/Nsc1	GSB Close Graded GR V	Cum	360.00	4,232.85	1,523,826
40	05.02	WMM	Cum	600.00	4,248.35	2,549,010
41	06/Nsc1	DBM GR II	cum	120.00	12,809.83	1,537,180
42	06/Nsc2	BC GR II	cum	60.00	13,951.50	837,090
43	09.01/nsc1	Hume Pipe(NP4 1200 dia Single ROW)	Rm	60.00	12,143.70	728,622
End of Sub Total Diversion Work						9,748,448
Total						51,968,191

Item Rate Analysis has been done considering




Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
Foundation						
1	10.20	Plain cement concrete M-15 mix with stone aggregate 20mm. Nominal size mechanically mixed and vibrated in foundation depth of 1.5m. below ground / bed level and or 1.5m. above ground/bed level i/c formwork.	cum	1,454.00	8963.58	13,033,045.32
2	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	10,984.00	221.12	2,428,782.08
Sub Total of Foundation						15,461,827.40
Sub Structure						
3	10.06/a	Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Sub-Structure	Ton	661.00	74215.85	49,056,676.85
4	10.20/b	Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting b)Selected Granular Material in Filling	cum	4,189.00	2325.46	9,741,351.94
5	10.20/c	Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting c)Filler Media behind abutment ,wing and return wall	cum	5,864.00	2308.26	13,535,636.64
6	15.03/f/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height	cum	8,261.00	11512.30	95,103,110.30

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
7	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	2,821.00	452.35	1,276,079.35
Sub Total of Sub Structure						168,712,855.08
Super Structure						
8	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm	sqm	2,139.00	15.88	33,967.32
9	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5% of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	86.00	13951.50	1,199,829.00
10	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	1,100.00	94.34	103,774.00

Item Rate Analysis has been done considering




Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
11	08/nsc/5	Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	m	430.00	6996.27	3,008,396.10
12	10.06/b	Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Super-Structure	Ton	96.00	74215.85	7,124,721.60
13	16.01/a/i	cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complete as per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m	cum	1,194.00	12025.96	14,358,996.24
14	16.11	Drainage Spouts complete as per drawing and Technical specification	each	134.00	2182.50	292,455.00



Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
15	16.17	Mastic asphalt (providing and laying 12mm thick mastic asphalt wearing courses on top of deck slab excluding prime coat with paving grade bitumen meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10cm centre in both direction, pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface, all complete as per clause 515) using Bitumen VG-40 (3/40)	sqm	2,139.00	554.06	1,185,134.34
Sub Total of Super Structure						27,307,273.60
Protection Work						
16	10.19	Dry Boulder pitching	cum	563.00	4780.11	2,691,201.93
17	13.01/a/i/Nsc	Earth work in excavation Ordinary soil For Protection Work	cum	3,357.00	221.12	742,299.84
18	16/nsc	For Protection Work - cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade upto 5m height	cum	1,851.00	10604.44	19,628,818.44
Sub Total of Protection Work						23,062,320.21
Miscellaneous Work						
19	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	1,100.00	94.34	103,774.00
Sub Total of Miscellaneous Work						103,774.00
Total of Bill 12. Culvert						234,648,050.29

Item Rate Analysis has been done considering

Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
Foundation						
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	2,306.05	221.12	509,913.33
2	13.01/a/ii	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth 3 m to 6 m	cum	267.00	297.22	79,357.74
3	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	104.00	9823.96	1,021,691.84
4	14.03/g	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M30 Grade	cum	334.00	12515.91	4,180,313.94
5	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification	MT	40.00	78704.35	3,148,174.00
Sub Total of Foundation						8,939,450.85
Sub Structure						
6	13.03/a	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials	cum	132.00	2157.35	284,770.20
7	13.03/b	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material	cum	2,891.00	1762.60	5,095,676.60
8	13.04	Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification .	cum	404.00	2426.81	980,431.24



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
9	15.03/g/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M30 Grade upto 5m height	cum	534.00	13380.53	7,145,203.02
10	15.03/h/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M35 Grade Pedestal	cum	26.00	12095.47	314,482.22
11	15.05	HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification	MT	75.00	78704.35	5,902,826.25
12	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	598.00	452.35	270,505.30
Sub Total of			Sub Structure			19,993,894.83
Super Structure						
13	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm	sqm	408.00	15.88	6,479.04



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
14	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5% of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	60.00	13951.50	837,090.00
15	14/nsc1 /i	Filler joint i)Providing & fixing 2 mm thick corrugated copper plate in expansion joint complete as per drawing & Technical Specification.	m	48.00	2080.60	99,868.80
16	14/nsc1 /ii	Filler joint Providing & fixing 20 mm thick compressible fibre board in expansion joint complete as per drawing & Technical Specification.	m	48.00	704.98	33,839.04
17	14/nsc1 /iii	Filler joint iii)Providing and fixing in position 20 mm thick premoulded joint filler in expansion joint for fixed ends of simply supported spans not exceeding 10 m to cater for a horizontal movement upto 20 mm, covered with sealant complete as per drawing and technical specifications.	m	48.00	225.23	10,811.04
18	14/nsc1 /iv	Filler joint iv)Providing and filling joint sealing compound as per drawings and technical specifications with coarse sand and 6 per cent bitumen by weight.	m	48.00	36.36	1,745.28
19	16.01/b/ i/c2/ii	RCC Grade M30 For solid slab super-structure Approach Slab	cum	226.00	13420.02	3,032,924.52



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
20	16.03	HYSD bar reinforcement in super-structure complete as per drawing and technical specifications	MT	41.00	86538.12	3,548,062.92
21	16.05	Cement concrete wearing coat M-30 grade including reinforcement complete as per drawing and Technical Specifications	cum	3.00	20410.52	61,231.56
22	16.08	Reinforced concrete railing of M30 Grade complete as per approved drawings and technical specification	Rm	74.00	2873.87	212,666.38
23	16.11	Drainage Spouts complete as per drawing and Technical specification	each	8.00	2182.50	17,460.00
24	16.12/N sc	Reinforced cement concrete approach slab M-30 including reinforcement and formwork complete as per drawing and Technical specification	cum	58.00	17453.91	1,012,326.78
25	16.13	PCC M15 ordinary Grade leveling course below approach slab complete as per drawing and Technical specification Below Approach Slab	cum	22.00	9604.60	211,301.20
26	16.17	Mastic asphalt (providing and laying 12mm thick mastic asphalt wearing courses on top of deck slab excluding prime coat with paving grade bitumen meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10cm centre in both direction, pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface, all complete as per clause 515) using Bitumen VG-40 (3/40)	sqm	408.00	554.06	226,056.48
Sub Total of			Super Structure			9,311,863.04
		Protection Work				

Item Rate Analysis has been done considering




Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
27	08/nsc/5	Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	m	74.00	6996.27	517,723.98
28	16/nsc	For Protection Work - cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade upto 5m height	cum	41.00	10604.44	434,782.04
29	17.01/a	laying apron complete as per drawing and Technical specification. Boulder	cum	59.00	5364.39	316,499.01
30	17.02	Filter material underneath pitching in slopes complete as per drawing and Technical specification	cum	30.00	3590.63	107,718.90
31	17.03/a	Pitching on slopes complete as per drawing and Technical specifications Stone	cum	61.00	4733.55	288,746.55
Sub Total of Protection Work						1,665,470.48
Miscellaneous Work						



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
32	02.04/i/c	Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above	cum	1,199.00	1756.40	2,105,923.60
33	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	508.00	94.34	47,924.72
34	08.12	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign as per IRC:67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing)	sqm	4.00	12543.94	50,175.76
35	13/nsc1	Confirmatory Boring in Soil	cum	12.00	2020.00	24,240.00
36	13/nsc2	Confirmatory Boring in Hard Rock	cum	20.00	4040.00	80,800.00
Sub Total of Miscellaneous Work						2,309,064.08
Diversion Work						
37	03.13	Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2	cum	6,400.00	161.80	1,035,520.00



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
38	03.31	Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres	cum	7,200.00	213.50	1,537,200.00
39	04.01/N-sc1	Sub-base with Close Graded Material (Table:-400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material	Cum	360.00	4232.85	1,523,826.00
40	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)	Cum	600.00	4248.35	2,549,010.00
41	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40	cum	120.00	12809.83	1,537,179.60

Item Rate Analysis has been done considering

Manipur Schedule of Rates For National Highways - Works 2018(PWD, Manipur)



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
42	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5% of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	60.00	13951.50	837,090.00
43	09.01/ns c1	Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia	Rm	60.00	12143.70	728,622.00
Sub Total of Diversion Work						9,748,447.60
Total of Bill 13. Minor Bridge						51,968,190.88

Item Rate Analysis has been done considering




**VARIABLE NOTATION
&
CHAINAGE DETAILS
(ROAD PART)**



TCS Number	TCS Description	Length (km)
TCS-1	Typical Cross Section of Two Lane Carriageway with Paved Shoulder in Built up area with Both side covered drain cum footpath in plain terrain	0.550
TCS-2	Typical Cross Section of Two Lane Carriageway with Paved Shoulder in Rural area in Plain Terrain (Reconstruction)	0.480
TCS-2A	Typical Cross Section of Two Lane Carriageway with Paved Shoulder in Rural area in Hilly Terrain (Reconstruction)	0.365
TCS-3	Typical Cross Section of Two Lane Carriageway with Paved Shoulder in Rural area with trapezoidal open drain on hill side and earthen shoulder on valley side (Reconstruction)	10.320
TCS-3A	Typical Cross Section of Two Lane Carriageway with Paved Shoulder in Rural area with trapezoidal open drain on hill side and earthen shoulder on valley side (New Construction)	0.260
TCS-4	Typical Cross Section of Two Lane Carriageway In Rural Area With Retaining Wall on Valley Side And Trapezoidal Open drain on Hill side (Reconstruction)	1.050
TCS-5	Typical Cross Section of Two Lane Carriageway In Rural Area With Breast Wall on Hill Side And Earthen Shoulder on Valley side (Reconstruction)	2.925
TCS-6	Typical Cross Section of Two Lane Carriageway In Built Up Area With Both Side Footpath Cum RCC Rectangular Covered Drain in Hilly Terrain (Reconstruction)	0.230
TCS-7	Typical Cross Section of Two Lane Carriageway In Built-Up Area With Breast Wall on Hill Side And Footpath Cum RCC Rectangular Covered Drain on Valley side (Reconstruction)	0.930
TCS-8	Typical Cross Section of Two Lane Carriageway In Rural Area With Retaining Wall on One Side And Earthen Shoulder on other side (Reconstruction)	0.070
Total =		17.180



Typical Cross Section

List of TCS

Design Chainage (m)		Length of CD (m)	Net Length (m)	TCS No.
From	To			
15940	16300	6.14	353.86	TCS-2
16300	16850	3.96	546.04	TCS-1
16850	16970		120	TCS-2
16970	17200	2.7	227.3	TCS-6
17200	17270	3.96	66.04	TCS-8
17270	17320		50	TCS-5
17320	17475		155	TCS-2A
17475	17525		50	TCS-4
17525	18225	7.9	692.1	TCS-3
18225	18275		50	TCS-4
18275	18350		75	TCS-5
18350	18410	2.6	57.4	TCS-4
18410	18590	3.96	176.04	TCS-3
18590	18670	2.7	77.3	TCS-4
18670	18750		80	TCS-3
18750	18825	2.7	72.3	TCS-2A
18825	19385	5.3	554.7	TCS-3
19385	19435		50	TCS-4
19435	19625	9.22	180.78	TCS-3
19625	19675		50	TCS-4
19675	20030	9.22	345.78	TCS-3
20030	20090		60	TCS-3A
20090	20225	2.6	132.4	TCS-2A
20225	20300	3.96	71.04	TCS-3
20300	23100	44.7	2755.3	TCS-5
23100	23850	7.92	742.08	TCS-3
23850	24000	2.6	147.4	TCS-7
24000	25750	28.52	1721.48	TCS-3
25750	25850		100	TCS-7
25850	25960		110	TCS-3
25960	26010		50	TCS-4
26010	26850	12.06	827.94	TCS-3
26850	27050	2.6	197.4	TCS-3A
27050	28370	26.22	1293.78	TCS-3
28370	28850	2.6	477.4	TCS-7
28850	29310	9.04	450.96	TCS-3
29310	29360		50	TCS-4
29360	29425		65	TCS-3
29425	29510	3.96	81.04	TCS-4
29510	30075	5.3	559.7	TCS-3
30075	30215		140	TCS-4




Design Chainage (m)		Length of CD (m)	Net Length (m)	TCS No.
From	To			
30215	30850	5.3	629.7	TCS-3
30850	31050	2.7	197.3	TCS-7
31050	31800	14.36	735.64	TCS-3
31800	31925		125	TCS-4
31925	31975		50	TCS-3
31975	32060		85	TCS-4
32060	32350	2.7	287.3	TCS-3
32350	32415		65	TCS-4
32415	32530	2.7	112.3	TCS-3
32530	32580		50	TCS-4
32580	32775		195	TCS-3
32775	32835	3.84	56.16	TCS-4
32835	33120	8	277	TCS-3
Total Length =		252	16928	

Summary of TCS Length :

TCS No.	Net Length (m)	CD Length (m)	Total Length (m)
TCS-1	546.0	4.0	550
TCS-2	473.9	6.1	480
TCS-2A	359.7	5.3	365
TCS-3	10158.3	161.7	10320
TCS-3A	257.4	2.6	260
TCS-4	1036.9	13.1	1050
TCS-5	2880.3	44.7	2925
TCS-6	227.3	2.7	230
TCS-7	922.1	7.9	930
TCS-8	66.0	4.0	70
Total =	16928	252	17180



Variable Declaration

TCS-01

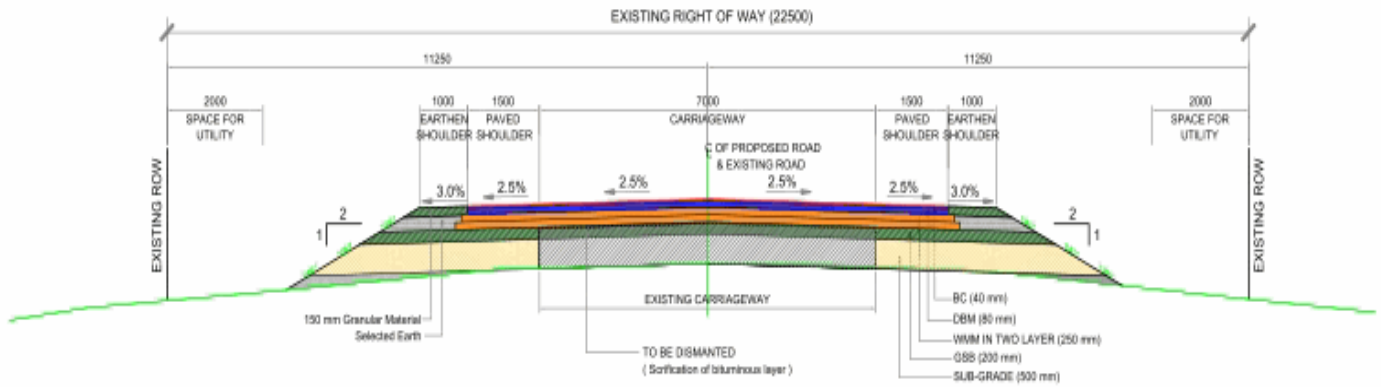
SI No	Variable Description	Variable	Dimension	Unit
1	Width of Carriageway	cw	7.000	m
2	Paved Shoulder	ps	1.500	m
3	BC Thickness	bc	0.040	m
4	DBM Thickness	dbm	0.080	m
5	WMM Layer-I Thickness	wmm1	0.125	m
6	GSB Thickness	gsb	0.200	m
7	Subgrade Thickness	sg	0.500	m
8	Length	l	546.000	m
9	Existing Pavement Width	ext_pav	6.700	m
10	Length of each centreline marking	lc	3.000	m
11	Width of each centreline marking	wc	0.100	m
12	No of Lines for Carriageway Marking for 2 Lane	nc	2.000	nos.
13	Width of Carriageway Marking	wid_mar	0.150	m
14	WMM Layer-II Thickness	wmm2	0.125	m
15	Earthen Shoulder	es	0.000	m
16	GSB Reuse	gsb_per	36.600	

Variable Declaration

TCS-02

SI No	Variable Description	Variable	Dimension	Unit
1	Width of Carriageway	cw	7.000	m
2	Paved Shoulder	ps	1.500	m
3	BC Thickness	bc	0.040	m
4	DBM Thickness	dbm	0.080	m
5	WMM Layer-I Thickness	wmm1	0.125	m
6	GSB Thickness	gsb	0.200	m
7	Subgrade Thickness	sg	0.500	m
8	Length	l	474.000	m
9	Existing Pavement Width	ext_pav	6.700	m
10	Length of each centreline marking	lc	3.000	m
11	Width of each centreline marking	wc	0.100	m
12	No of Lines for Carriageway Marking for 2 Lane	nc	2.000	nos.
13	Width of Carriageway Marking	wid_mar	0.150	m
14	WMM Layer-II Thickness	wmm2	0.125	m
15	Earthen Shoulder	es	1.000	m
16	GSB Reuse	gsb_per	36.600	
17	Hard Shoulder	hs	1.000	m
18	150mm GSB at Earthen Shoulder Portion area	es_gsb	0.158	sqm
19	Earthen Shoulder Portion area	es_area	0.343	sqm

Variable Declaration



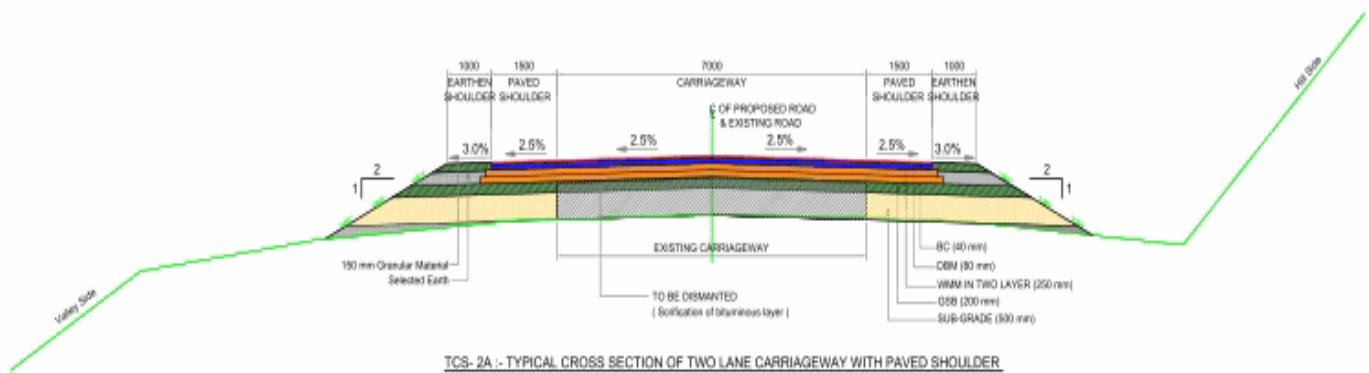
**TCS- 2 -> TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY WITH PAVED SHOULDER
RURAL AREA IN PLAIN TERRAIN (RECONSTRUCTION)**

Variable Declaration

TCS-02A

SI No	Variable Description	Variable	Dimension	Unit
1	Width of Carriageway	cw	7.000	m
2	Paved Shoulder	ps	1.500	m
3	BC Thickness	bc	0.040	m
4	DBM Thickness	dbm	0.080	m
5	WMM Layer-I Thickness	wmm1	0.125	m
6	GSB Thickness	gsb	0.200	m
7	Subgrade Thickness	sg	0.500	m
8	Length	l	360.000	m
9	Existing Pavement Width	ext_pav	6.700	m
10	Length of each centreline marking	lc	3.000	m
11	Width of each centreline marking	wc	0.100	m
12	No of Lines for Carriageway Marking for 2 Lane	nc	2.000	nos.
13	Width of Carriageway Marking	wid_mar	0.150	m
14	WMM Layer-II Thickness	wmm2	0.125	m
15	Earthen Shoulder	es	1.000	m
16	GSB Reuse	gsb_per	36.600	
17	Hard Shoulder	hs	1.000	m
18	150mm GSB at Earthen Shoulder Portion area	es_gsb	0.158	sqm
19	Earthen Shoulder Portion area	es_area	0.343	sqm

Variable Declaration

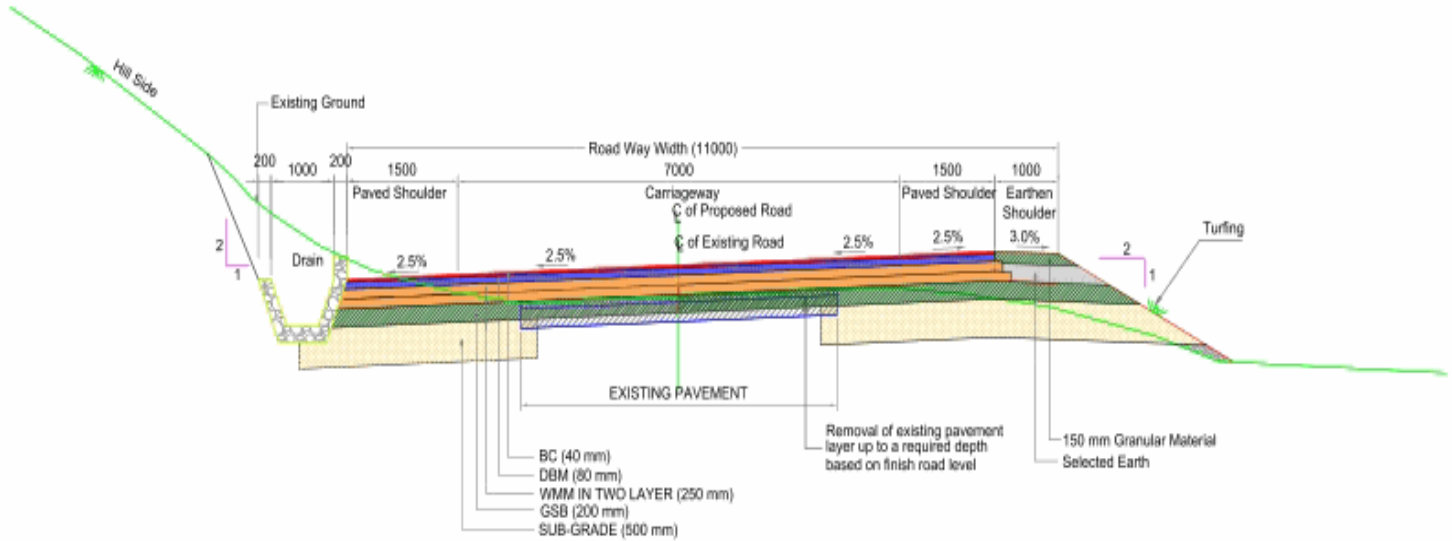


Variable Declaration

TCS-03

SI No	Variable Description	Variable	Dimension	Unit
1	Width of Carriageway	cw	7.000	m
2	Paved Shoulder	ps	1.500	m
3	BC Thickness	bc	0.040	m
4	DBM Thickness	dbm	0.080	m
5	WMM Layer-I Thickness	wmm1	0.125	m
6	GSB Thickness	gsb	0.200	m
7	Subgrade Thickness	sg	0.500	m
8	Length	l	10158.000	m
9	Existing Pavement Width	ext_pav	6.700	m
10	Length of each centreline marking	lc	3.000	m
11	Width of each centreline marking	wc	0.100	m
12	No of Lines for Carriageway Marking for 2 Lane	nc	2.000	nos.
13	Width of Carriageway Marking	wid_mar	0.150	m
14	WMM Layer-II Thickness	wmm2	0.125	m
15	Earthen Shoulder	es	1.000	m
16	GSB Reuse	gsb_per	36.600	
17	Hard Shoulder	hs	1.000	m
18	150mm GSB at Earthen Shoulder Portion area	es_gsb	0.171	sqm
19	Earthen Shoulder Portion area	es_area	0.315	sqm

Variable Declaration



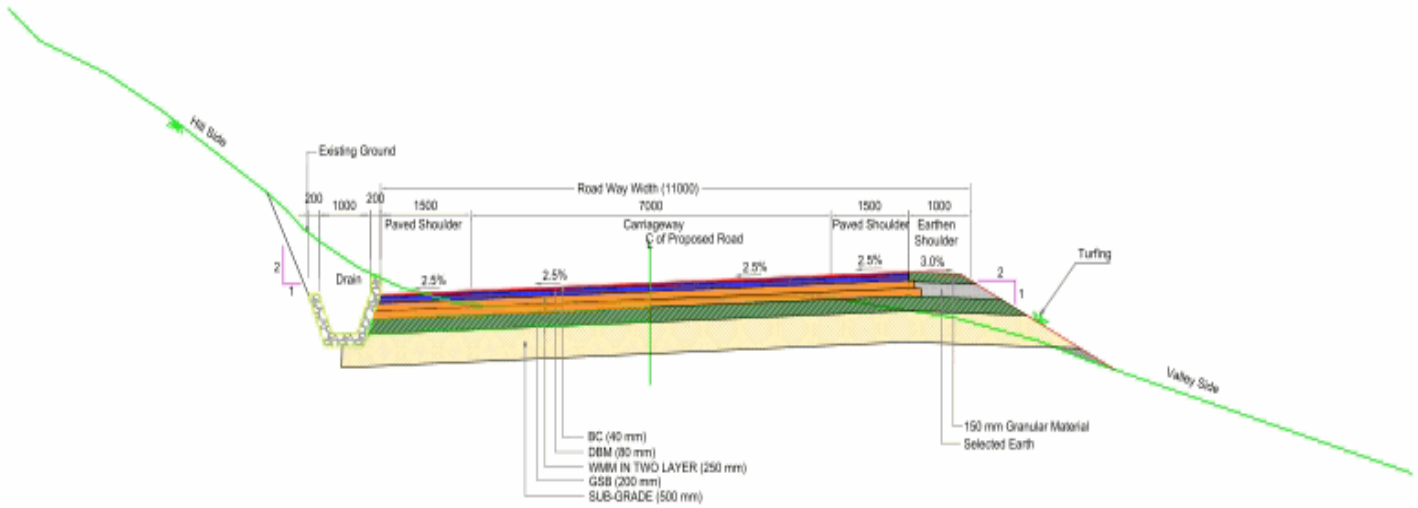
TCS-3 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN RURAL AREA WITH TRAPEZOIDAL OPEN DRAIN ON HILL SIDE AND EARTHEN SHOULDER ON VALLEY SIDE (RECONSTRUCTION)

Variable Declaration

TCS-03A

SI No	Variable Description	Variable	Dimension	Unit
1	Width of Carriageway	cw	7.000	m
2	Paved Shoulder	ps	1.500	m
3	BC Thickness	bc	0.040	m
4	DBM Thickness	dbm	0.080	m
5	WMM Layer-I Thickness	wmm1	0.125	m
6	GSB Thickness	gsb	0.200	m
7	Subgrade Thickness	sg	0.500	m
8	Length	l	257.000	m
9	Existing Pavement Width	ext_pav	0.000	m
10	Length of each centreline marking	lc	3.000	m
11	Width of each centreline marking	wc	0.100	m
12	No of Lines for Carriageway Marking for 2 Lane	nc	2.000	nos.
13	Width of Carriageway Marking	wid_mar	0.150	m
14	WMM Layer-II Thickness	wmm2	0.125	m
15	Earthen Shoulder	es	1.000	m
16	GSB Reuse	gsb_per	36.600	
17	Hard Shoulder	hs	1.000	m
18	150mm GSB at Earthen Shoulder Portion area	es_gsb	0.171	sqm
19	Earthen Shoulder Portion area	es_area	0.315	sqm

Variable Declaration



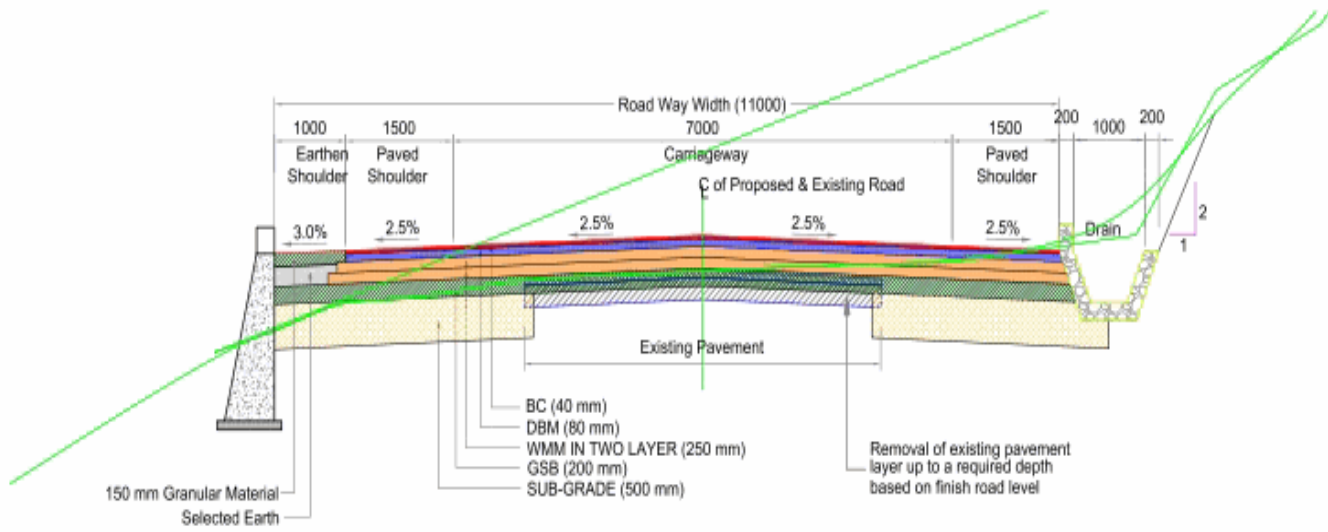
TCS-3A : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY WITH PAVED SHOULDER IN RURAL AREA WITH TRAPEZOIDAL OPEN DRAIN ON HILL SIDE AND EARTHEN SHOULDER ON VALLEY SIDE (NEW CONSTRUCTION)

Variable Declaration

TCS-04

SI No	Variable Description	Variable	Dimension	Unit
1	Width of Carriageway	cw	7.000	m
2	Paved Shoulder	ps	1.500	m
3	BC Thickness	bc	0.040	m
4	DBM Thickness	dbm	0.080	m
5	WMM Layer-I Thickness	wmm1	0.125	m
6	GSB Thickness	gsb	0.200	m
7	Subgrade Thickness	sg	0.500	m
8	Length	l	1037.000	m
9	Existing Pavement Width	ext_pav	6.700	m
10	Length of each centreline marking	lc	3.000	m
11	Width of each centreline marking	wc	0.100	m
12	No of Lines for Carriageway Marking for 2 Lane	nc	2.000	nos.
13	Width of Carriageway Marking	wid_mar	0.150	m
14	WMM Layer-II Thickness	wmm2	0.125	m
15	Earthen Shoulder	es	1.000	m
16	GSB Reuse	gsb_per	36.600	
17	Hard Shoulder	hs	1.000	m
18	150mm GSB at Earthen Shoulder Portion area	es_gsb	0.171	sqm
19	Earthen Shoulder Portion area	es_area	0.315	sqm

Variable Declaration



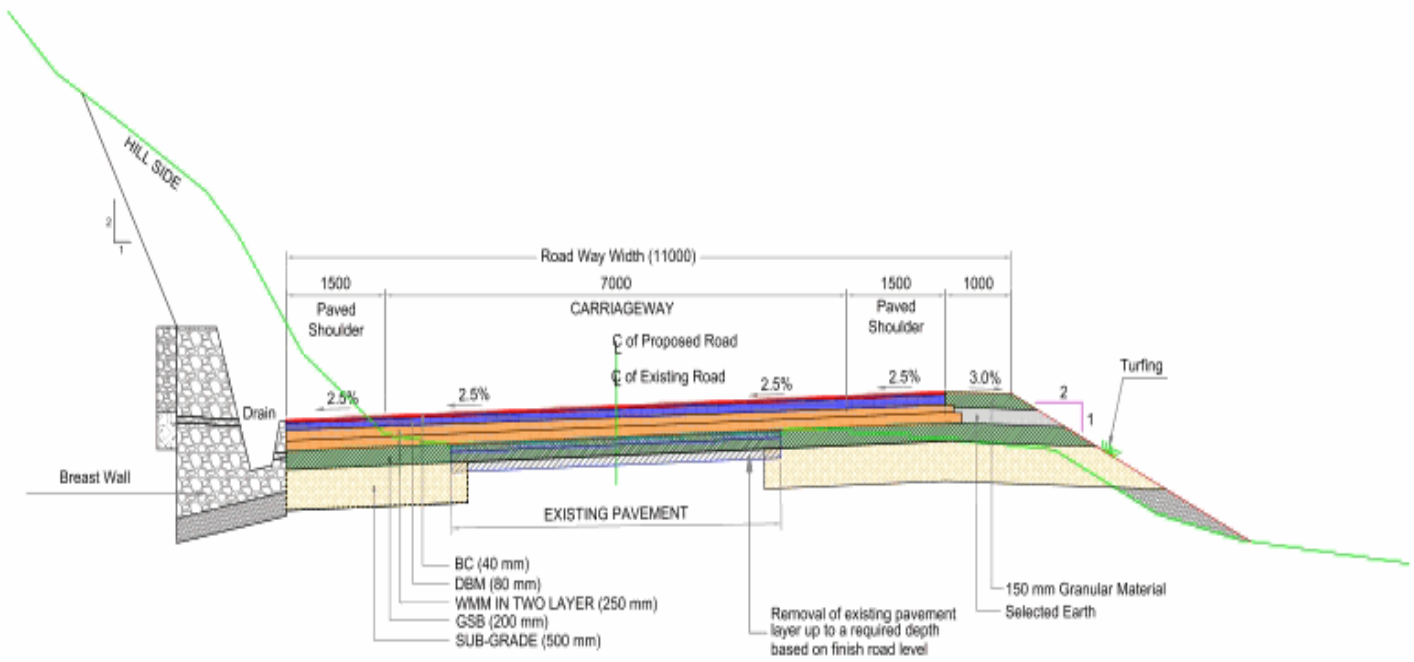
TCS-4 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN RURAL AREA WITH RETAINING WALL ON VALLEY SIDE AND TRAPEZOIDAL OPEN DRAIN ON HILL SIDE (RECONSTRUCTION)

Variable Declaration

TCS-05

SI No	Variable Description	Variable	Dimension	Unit
1	Width of Carriageway	cw	7.000	m
2	Paved Shoulder	ps	1.500	m
3	BC Thickness	bc	0.040	m
4	DBM Thickness	dbm	0.080	m
5	WMM Layer-I Thickness	wmm1	0.125	m
6	GSB Thickness	gsb	0.200	m
7	Subgrade Thickness	sg	0.500	m
8	Length	l	2880.000	m
9	Existing Pavement Width	ext_pav	6.700	m
10	Length of each centreline marking	lc	3.000	m
11	Width of each centreline marking	wc	0.100	m
12	No of Lines for Carriageway Marking for 2 Lane	nc	2.000	nos.
13	Width of Carriageway Marking	wid_mar	0.150	m
14	WMM Layer-II Thickness	wmm2	0.125	m
15	Earthen Shoulder	es	1.000	m
16	GSB Reuse	gsb_per	36.600	
17	Hard Shoulder	hs	1.000	m
18	150mm GSB at Earthen Shoulder Portion area	es_gsb	0.171	sqm
19	Earthen Shoulder Portion area	es_area	0.315	sqm

Variable Declaration



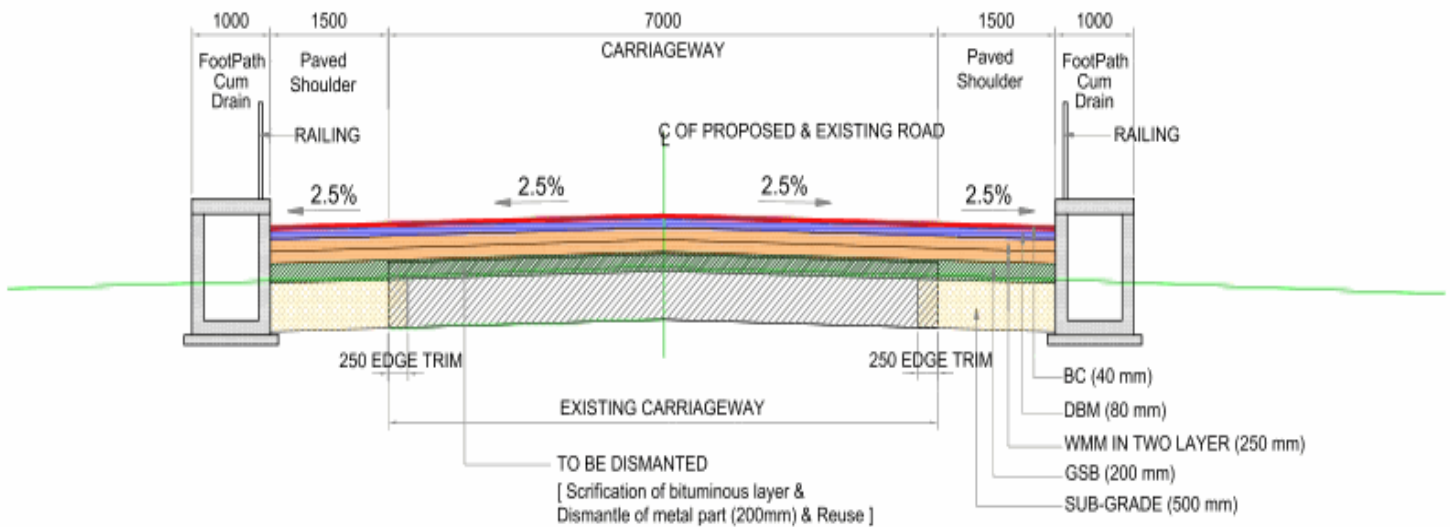
TCS-5 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN RURAL AREA WITH BREAST WALL ON HILL SIDE AND EARTHEN SHOULDER ON VALLEY SIDE (RECONSTRUCTION)

Variable Declaration

TCS-06

SI No	Variable Description	Variable	Dimension	Unit
1	Width of Carriageway	cw	7.000	m
2	Paved Shoulder	ps	1.500	m
3	BC Thickness	bc	0.040	m
4	DBM Thickness	dbm	0.080	m
5	WMM Layer-I Thickness	wmm1	0.125	m
6	GSB Thickness	gsb	0.200	m
7	Subgrade Thickness	sg	0.500	m
8	Length	l	227.000	m
9	Existing Pavement Width	ext_pav	6.700	m
10	Length of each centreline marking	lc	3.000	m
11	Width of each centreline marking	wc	0.100	m
12	No of Lines for Carriageway Marking for 2 Lane	nc	2.000	nos.
13	Width of Carriageway Marking	wid_mar	0.150	m
14	WMM Layer-II Thickness	wmm2	0.125	m
15	Earthen Shoulder	es	0.000	m
16	GSB Reuse	gsb_per	36.600	

Variable Declaration



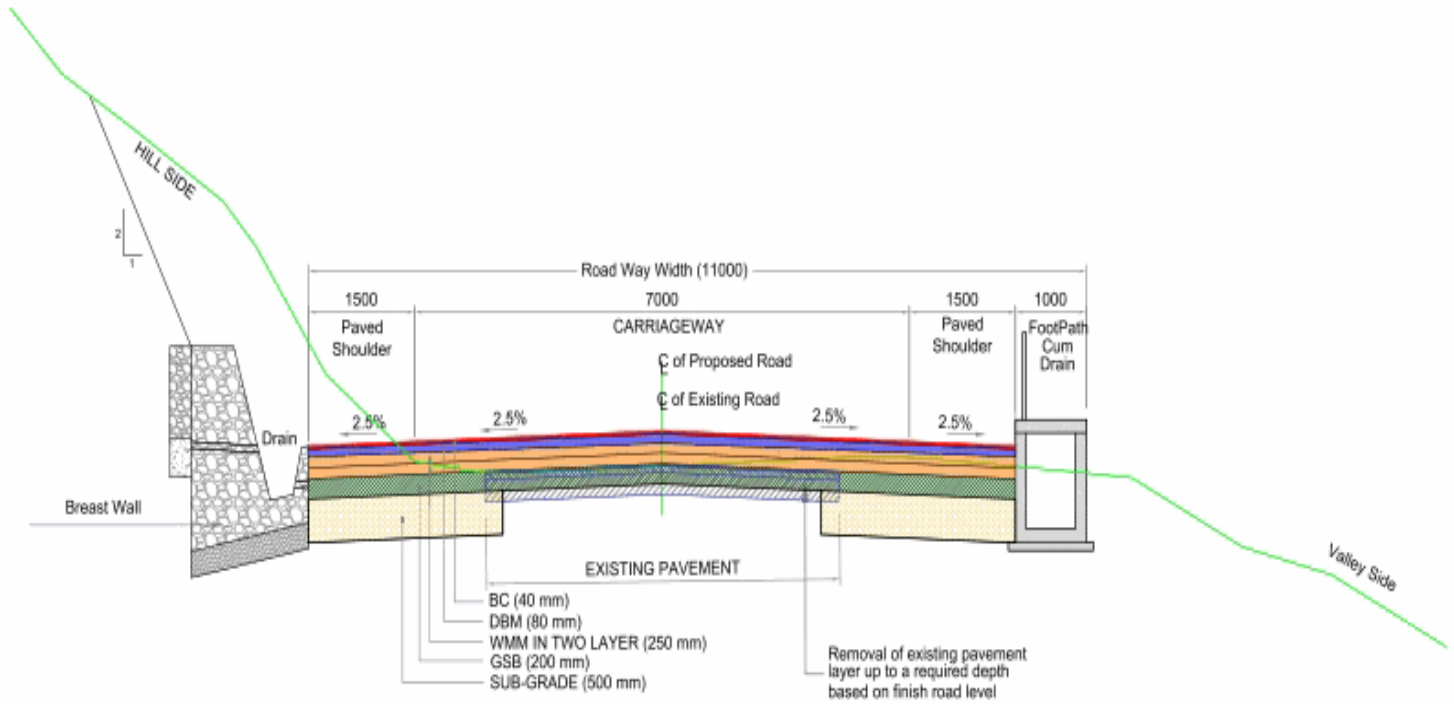
TCS-6 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN BUILT UP AREA WITH BOTH SIDE FOOTPATH CUM RCC RECTANGULAR COVERED DRAIN IN HILLY TERRAIN (RECONSTRUCTION)

Variable Declaration

TCS-07

SI No	Variable Description	Variable	Dimension	Unit
1	Width of Carriageway	cw	7.000	m
2	Paved Shoulder	ps	1.500	m
3	BC Thickness	bc	0.040	m
4	DBM Thickness	dbm	0.080	m
5	WMM Layer-I Thickness	wmm1	0.125	m
6	GSB Thickness	gsb	0.200	m
7	Subgrade Thickness	sg	0.500	m
8	Length	l	922.000	m
9	Existing Pavement Width	ext_pav	6.700	m
10	Length of each centreline marking	lc	3.000	m
11	Width of each centreline marking	wc	0.100	m
12	No of Lines for Carriageway Marking for 2 Lane	nc	2.000	nos.
13	Width of Carriageway Marking	wid_mar	0.150	m
14	WMM Layer-II Thickness	wmm2	0.125	m
15	Earthen Shoulder	es	0.000	m
16	GSB Reuse	gsb_per	36.600	

Variable Declaration



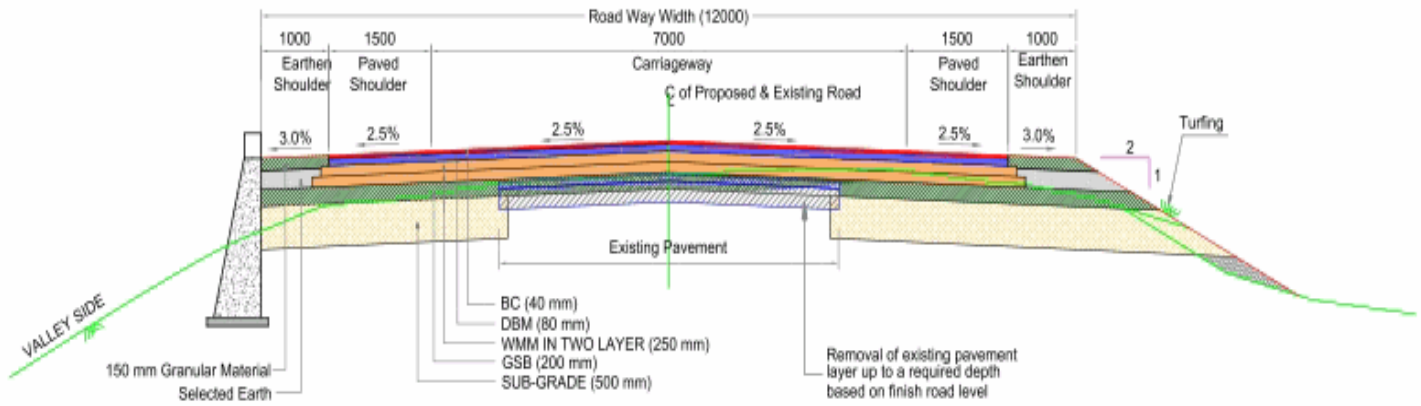
TCS-7 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN BUILT-UPAREA WITH BREAST WALL ON HILL SIDE AND FOOTPATH CUM RCC RECTANGULAR COVERED DRAIN ON VALLEY SIDE (RECONSTRUCTION)

Variable Declaration

TCS-08

SI No	Variable Description	Variable	Dimension	Unit
1	Width of Carriageway	cw	7.000	m
2	Paved Shoulder	ps	1.500	m
3	BC Thickness	bc	0.040	m
4	DBM Thickness	dbm	0.080	m
5	WMM Layer-I Thickness	wmm1	0.125	m
6	GSB Thickness	gsb	0.200	m
7	Subgrade Thickness	sg	0.500	m
8	Length	l	66.000	m
9	Existing Pavement Width	ext_pav	6.700	m
10	Length of each centreline marking	lc	3.000	m
11	Width of each centreline marking	wc	0.100	m
12	No of Lines for Carriageway Marking for 2 Lane	nc	2.000	nos.
13	Width of Carriageway Marking	wid_mar	0.150	m
14	WMM Layer-II Thickness	wmm2	0.125	m
15	Earthen Shoulder	es	1.000	m
16	GSB Reuse	gsb_per	36.600	
17	Hard Shoulder	hs	1.000	m
18	150mm GSB at Earthen Shoulder Portion area	es_gsb	0.171	sqm
19	Earthen Shoulder Portion area	es_area	0.315	sqm

Variable Declaration



**TCS-8 : TYPICAL CROSS SECTION OF TWO LANE CARRIAGEWAY IN RURAL AREA
WITH RETAINING WALL ON ONE SIDE AND EARTHEN SHOULDER ON OTHER SIDE (RECONSTRUCTION)**

Site Clearance and Dismantling

A. Tree Cutting

SI No	Girth Details		
1	Girth from 300 mm to 600 mm	5	Each
1	Girth from 600 mm to 900 mm	22	Each
2	Girth from 900 mm to 1800 mm	118	Each
4	Girth from 1800 mm to 2700 mm	23	Each

..... Bill No- 01, Sl. No- 1
 Bill No- 01, Sl. No- 2
 Bill No- 01, Sl. No- 3
 Bill No- 01, Sl. No- 4

B. Clearing and grubbing

Clearing and Grubbing Area 29.25 Ha

..... Bill No- 01, Sl. No-6

C. Dismantling

SI No A. Rubble stone masonry in cement mortar

1	Culvert	=	1656	Cum
		Total=	1656	cum

..... Bill No- 01, Sl. No- 8

SI No B. Total Dismantling of Reinforced cement concrete

1	Culvert	=	126	Cum
		Total=	126	cum

..... Bill No- 01, Sl. No- 7

SI No C. Total Dismantling Hume Pipe Culvert

1	up to 600 mm dia=	30	m
2	600-900 mm dia=	60	m
3	above 900 mm dia=	340	m

..... Bill No- 01, Sl. No- 9
 Bill No- 01, Sl. No-10
 Bill No- 01, Sl. No- 11

SI No D. Total Dismantling of Bituminous layer

1	Road	=	163400	sqm
		Total=	163400	sqm

..... Bill No- 01, Sl. No- 12

SI No E. Total Dismantling of Granular Layer

1	Road	=	185655	sqm
	Refer backup calculation sheet			
		Total=	185655	sqm

..... Bill No- 01, Sl. No- 13




**Site Clearance and Dismantling
(Tree Cutting List)**

SI No	Design Ch	EASTING(M)	NORTHING	Side	GIRTH (M)
1	15+940	580818.818	2739782.879	LHS	2
2	15+940	580816.958	2739783.55	LHS	1.3
3	15+944	580813.805	2739782.973	LHS	1.6
4	15+950	580807.41	2739786.263	LHS	1.9
5	15+952	580805.557	2739786.728	LHS	1.5
6	15+952	580804.62	2739785.394	LHS	1.2
7	15+952	580805.53	2739785.284	LHS	1.6
8	15+960	580798.271	2739787.997	LHS	1.8
9	15+962	580799.7	2739799.246	RHS	1.4
10	15+966	580792.448	2739789.637	LHS	2
11	15+966	580792.575	2739789.231	LHS	1.4
12	15+968	580791.019	2739790.952	LHS	2
13	15+968	580791.026	2739790.7	LHS	1.6
14	15+968	580793.46	2739802.412	RHS	1.3
15	15+970	580788.298	2739790.995	LHS	1.3
16	15+970	580788.437	2739789.889	LHS	1.5
17	15+974	580787.849	2739803.185	RHS	1.3
18	15+974	580784.472	2739792.116	LHS	1.6
19	15+978	580784.241	2739803.603	RHS	1
20	15+984	580774.495	2739794.401	LHS	1.9
21	15+996	580763.102	2739797.642	LHS	1.5
22	15+996	580766.883	2739809.083	RHS	1.3
23	16+012	580747.516	2739802.248	LHS	1.8
24	16+014	580744.968	2739802.611	LHS	1.3
25	16+016	580746.795	2739814.663	RHS	1.5
26	16+020	580739.435	2739804.965	LHS	1.9
27	16+020	580743.279	2739815.93	RHS	1.6
28	16+030	580730.355	2739807.625	LHS	2
29	16+032	580728.341	2739808.344	LHS	1.3
30	16+032	580731.635	2739818.96	RHS	1.4
31	16+036	580728.371	2739819.833	RHS	2
32	16+038	580725.293	2739820.737	RHS	1.2
33	16+048	580713.531	2739811.204	LHS	0.8
34	16+058	580706.493	2739825.775	RHS	1.9
35	16+062	580702.072	2739826.949	RHS	2.3
36	16+062	580699.555	2739816.101	LHS	1.3
37	16+072	580693.467	2739829.457	RHS	1.6
38	16+074	580687.481	2739819.785	LHS	1.5
39	16+076	580689.219	2739830.735	RHS	1
40	16+078	580683.805	2739820.246	LHS	0.8
41	16+080	580682.922	2739821.322	LHS	0.7
42	16+082	580680.467	2739821.539	LHS	1
43	16+090	580673.567	2739823.867	LHS	1.6
44	16+092	580673.84	2739835.209	RHS	0.9
45	16+100	580663.925	2739826.303	LHS	1.7
46	16+102	580661.124	2739826.966	LHS	1.6
47	16+164	580601.075	2739843.437	LHS	1.5
48	16+166	580599.309	2739844.076	LHS	1.3
49	16+168	580597.753	2739844.402	LHS	1.9
50	16+174	580594.122	2739857.907	RHS	1.9
51	16+176	580593.375	2739859.37	RHS	1.8
52	16+176	580590.667	2739846.565	LHS	1.5
53	16+178	580588.641	2739847.023	LHS	1.6
54	16+180	580588.351	2739859.438	RHS	2.6
55	16+180	580585.792	2739847.883	LHS	1.5
56	16+182	580584.402	2739848.421	LHS	1.2
57	16+184	580582.873	2739848.788	LHS	1.3
58	16+188	580580.772	2739861.593	RHS	1
59	16+190	580575.3	2739849.918	LHS	1.2
60	16+196	580570.735	2739852.261	LHS	1.3
61	16+198	580571.429	2739864.363	RHS	0.8
62	16+204	580563.931	2739854.403	LHS	0.8
63	16+210	580559.861	2739867.674	RHS	1.7



**Site Clearance and Dismantling
(Tree Cutting List)**

SI No	Design Ch	EASTING(M)	NORTHING	Side	GIRTH (M)
64	16+214	580556.962	2739869.056	RHS	1.4
65	16+220	580551.171	2739870.332	RHS	0.8
66	16+222	580544.881	2739859.971	LHS	1.5
67	16+224	580546.331	2739871.679	RHS	1
68	16+230	580537.405	2739862.421	LHS	1.3
69	16+240	580527.743	2739864.511	LHS	1.6
70	16+252	580521.001	2739879.086	RHS	1.5
71	16+254	580515.464	2739868.773	LHS	1.6
72	16+254	580517.242	2739880.069	RHS	1
73	16+258	580510.9	2739869.708	LHS	0.7
74	16+264	580506.204	2739870.973	LHS	1.5
75	16+272	580497.75	2739874.591	LHS	0.8
76	16+290	580480.627	2739878.452	LHS	0.5
77	16+312	580459.645	2739881.397	LHS	1.4
78	16+342	580429.527	2739888.77	LHS	1.5
79	16+478	580294.916	2739901.402	LHS	1.6
80	16+494	580279.363	2739902.133	LHS	1.7
81	16+516	580257.722	2739902.821	LHS	1.3
82	16+750	580029.059	2739940.693	RHS	1.6
83	16+752	580027.276	2739941.561	RHS	1.6
84	16+754	580024.854	2739943.697	RHS	1.5
85	16+760	580020.127	2739945.464	RHS	0.9
86	16+762	580018.335	2739945.771	RHS	0.9
87	16+766	580013.498	2739948.053	RHS	1.8
88	16+772	580008.222	2739950.556	RHS	1.2
89	16+774	580006.435	2739951.484	RHS	1.5
90	16+776	580004.983	2739951.956	RHS	1.5
91	16+786	579991.882	2739947.188	LHS	1.9
92	16+820	579960.67	2739959.907	LHS	1.5
93	16+894	579906.344	2740009.168	RHS	0.8
94	16+920	579896.207	2740034.164	RHS	1.3
95	16+926	579893.525	2740039.251	RHS	1.8
96	16+962	579880.064	2740071.063	RHS	1
97	16+962	579879.739	2740071.936	RHS	1.5
98	16+984	579871.611	2740090.225	RHS	0.8
99	17+000	579870.795	2740101.295	RHS	1
100	17+036	579896.149	2740124.081	LHS	1.5
101	17+216	579948.659	2740259.073	RHS	1.1
102	17+416	580058.419	2740317.791	LHS	1.2
103	17+486	579996.082	2740350.682	RHS	0.9
104	17+496	579989.785	2740357.852	RHS	1
105	17+516	579966.861	2740360.759	LHS	1
106	17+518	579966.872	2740365.251	LHS	0.9
107	17+520	579965.421	2740365.078	LHS	0.9
108	17+528	579957.402	2740370.138	LHS	1
109	17+590	579927.951	2740424.993	RHS	0.8
110	17+624	579921.985	2740454.848	RHS	1.5
111	17+790	579817.168	2740506.938	RHS	1
112	17+792	579816.995	2740504.53	RHS	1




**Site Clearance and Dismantling
(Tree Cutting List)**

SI No	Design Ch	EASTING(M)	NORTHING	Side	GIRTH (M)
113	17+798	579817.109	2740499.654	RHS	1.1
114	17+820	579812.991	2740477.035	RHS	1.8
115	17+820	579812.858	2740476.875	RHS	1
116	17+824	579811.689	2740472.374	RHS	1.1
117	17+830	579810.429	2740467.937	RHS	1
118	17+868	579804.858	2740429.794	RHS	1.6
119	17+890	579799.318	2740409.954	RHS	1.1
120	17+896	579797.146	2740405.637	RHS	0.6
121	17+908	579792.519	2740397.858	RHS	0.9
122	17+910	579791.044	2740396.493	RHS	1
123	17+920	579784.525	2740393.76	RHS	0.8
124	17+928	579779.049	2740392.868	RHS	0.6
125	17+932	579775.576	2740392.866	RHS	0.8
126	17+934	579773.623	2740392.637	RHS	0.7
127	17+960	579746.368	2740380.702	LHS	1.3
128	17+962	579744.506	2740384.391	LHS	1.3
129	17+966	579741.706	2740387.081	LHS	1.5
130	18+042	579665.447	2740408.353	LHS	1.6
131	18+048	579662.404	2740412.092	LHS	1.3
132	18+058	579656.351	2740422.919	LHS	0.9
133	18+104	579663.26	2740470.586	RHS	1.6
134	18+104	579665.525	2740471.605	RHS	1
135	18+820	579279.976	2740612.144	RHS	1.6
136	20+052	578619.64	2740755.178	RHS	1.5
137	20+058	578621.697	2740760.974	RHS	1.4
138	20+064	578624.883	2740766.77	RHS	1.5
139	20+070	578627.335	2740772.964	LHS	1.6
140	20+074	578623.813	2740778.03	LHS	1.2
141	20+094	578632.077	2740798.133	LHS	1.6
142	20+208	578697.07	2740882.105	RHS	1.6
143	20+458	578581.401	2741059.449	RHS	0.8
144	20+460	578578.391	2741058.968	RHS	2
145	20+462	578574.811	2741059.789	RHS	1.3
146	20+480	578555.714	2741053.885	RHS	1.7
147	20+482	578553.577	2741052.875	RHS	1.2
148	21+924	578690.979	2741670.291	LHS	1.5
149	22+424	578472.39	2741984.252	LHS	0.5
150	22+592	578318.273	2742006.937	LHS	0.7
151	22+654	578296.184	2741960.452	LHS	0.8
152	23+920	577858.533	2742294.912	LHS	1.3
153	23+942	577849.096	2742316.236	LHS	0.9
154	24+098	577788.312	2742458.805	LHS	0.7
155	24+114	577783.272	2742474.607	LHS	1.3
156	24+120	577782.954	2742480.767	LHS	0.5
157	25+684	576937.779	2743344.864	RHS	0.9
158	27+672	576088.454	2744516.799	RHS	0.8
159	27+674	576087.222	2744518.301	RHS	0.5
160	27+678	576086.198	2744520.29	RHS	0.5
161	27+682	576085.397	2744524.017	RHS	0.7
162	28+172	575866.658	2744874.713	LHS	1
163	31+040	574327.022	2744118.707	LHS	1.6
164	31+044	574329.571	2744105.574	RHS	1.5
165	31+048	574335.333	2744119.232	LHS	1.3
166	31+272	574352.103	2743950.876	RHS	1.5
167	31+316	574333.784	2743918.081	RHS	2.6
168	31+330	574323.589	2743909.52	RHS	1.8

Summary:

Girth from 300 mm to 600 mm	5 Nos
Girth from 600 mm to 900 mm	22 Nos
Girth from 900 mm to 1800 mm	118 Nos
Girth from 1800 mm to 2700 mm	23 Nos
Above 2700 mm	0 Nos




Site Clearance and Dismantling
Clearing and Grubbing Road Land

TCS Type	Net Length (m)	Existing Road Width (m)	Width to be cleared and grubbed (m)	Area to be cleared and grubbed (Ha)
TCS-1	546	6.7	24.0	0.94
TCS-2	474	6.8	24.0	0.82
TCS-2A	360	6.7	24.0	0.62
TCS-3	10158	6.7	24.0	17.57
TCS-3A	257	6.7	24.0	0.45
TCS-4	1037	6.7	24.0	1.79
TCS-5	2880	6.8	24.0	4.95
TCS-6	227	6.7	24.0	0.39
TCS-7	922	6.7	24.0	1.60
TCS-8	66	6.7	24.0	0.11

Total= 29.25

Total area of clearing & grubbing=

29.25 ha



Site Clearance and Dismantling
Calculation of Quantities for Dismantling

Sl. No.	Brief Description	Unit	Survey ch.	No.	L	B / H	T	Quantity	Total Quantity
			17.023	2	5.6	2.6	0.8	23.30	
			17.255	2	5.6	2.6	0.8	23.30	
			18.048	2	5.6	2.6	0.8	23.30	
			18.158	2	5.6	2.6	0.8	23.30	
			18.341	2	5.6	2.6	0.8	23.30	
			18.586	2	5.5	2.5	0.8	22.00	
			19.516	2	5.8	2.8	0.8	25.98	
			19.638	2	5.6	2.6	0.8	23.30	
			19.915	2	5.6	2.6	0.8	23.30	
			19.990	2	5.6	2.6	0.8	23.30	
			20.155	2	5.6	2.6	0.8	23.30	
			20.298	2	5.6	2.6	0.8	23.30	
			20.679	2	5.8	2.8	0.8	25.98	
			21.322	2	5.8	2.8	0.8	25.98	
			21.664	2	5.8	2.8	0.8	25.98	
			21.770	2	5.6	2.6	0.8	23.30	
			21.900	2	5.6	2.6	0.8	23.30	
			22.184	2	5.6	2.6	0.8	23.30	
			22.449	2	5.6	2.6	0.8	23.30	
			22.524	2	5.6	2.6	0.8	23.30	
			22.667	2	5.6	2.6	0.8	23.30	
			22.885	2	5.6	2.6	0.8	23.30	
			23.034	2	5.6	2.6	0.8	23.30	
			23.351	2	5.6	2.6	0.8	23.30	
			23.565	2	6.6	2.6	0.8	27.46	
			25.545	2	5.6	2.6	0.8	23.30	
			25.813	2	5.5	2.5	0.8	22.00	
			26.251	2	5.6	2.6	0.8	23.30	
			26.603	2	5.6	2.6	0.8	23.30	
			26.847	2	5.6	2.6	0.8	23.30	
			27.025	2	5.6	2.6	0.8	23.30	
			26.102	2	5.6	2.6	0.8	23.30	
			27.300	2	5.5	2.5	0.8	22.00	
			27.351	2	5.6	2.6	0.8	23.30	
			27.500	2	5.2	2.2	0.8	18.30	
			27.745	2	5.2	2.2	0.8	18.30	
			27.903	2	5.5	2.5	0.8	22.00	
			28.117	2	5.6	2.6	0.8	23.30	
			28.884	2	5.5	2.5	0.8	22.00	
			29.848	2	5.8	2.8	0.8	25.98	
			31.232	2	4.9	1.9	0.8	14.90	
			31.367	2	5.5	2.5	0.8	22.00	
			31.897	2	5.6	2.6	0.8	23.30	

A) Stone
Masonry

Head wall for
existing pipe culvert
H=h, Length=L, and
thickness=t

Cum



Site Clearance and Dismantling
Calculation of Quantities for Dismantling

Sl. No.	Brief Description	Unit	Survey ch.	No.	L	B / H	T	Quantity	Total Quantity
A) Stone Masonry	Abutments for existing slab culvert H=h, Length=L, and thickness=t.	cum	16.125	2	10.5	3.00	0.50	31.50	
			16.536	2	12.3	3.00	0.50	36.90	
			18.672	2	12.7	3.00	0.50	38.10	
			18.786	2	9.8	3.00	0.50	29.40	
			19.033	2	9.5	3.00	0.50	28.50	
			19.292	2	9.7	3.00	0.50	29.10	
			20.912	2	10.5	3.00	0.50	31.50	
			22.408	2	10.8	3.00	0.50	32.40	
			24.672	2	12.4	3.00	0.50	37.20	
			24.999	2	9.0	3.00	0.50	27.00	
			27.700	2	7.4	3.00	0.50	22.20	
			28.226	2	12.1	3.00	0.50	36.30	
			28.392	2	9.7	3.00	0.50	29.10	
			29.115	2	10.0	3.00	0.50	30.00	
			29.185	2	9.7	3.00	0.50	29.10	
			29.740	2	8.5	3.00	0.50	25.50	
			30.272	2	9.0	3.00	0.50	27.00	
			31.025	2	7.0	3.00	0.50	21.00	
			31.703	2	11.0	3.00	0.50	33.00	
			32.269	2	10.0	3.00	0.50	30.00	
32.721	2	9.4	3.00	0.50	28.20				
33.102	2	10.0	3.00	0.50	30.00				
Total =								1656.17	



**Site Clearance and Dismantling
Calculation of Quantities for Dismantling**

Sl. No.	Brief Description	Unit	Survey ch.	No.	L	B / H	T	Quantity	Total Quantity
B) RCC	For Slab culvert	Cum	16.125	1	10.5	1.20	0.3	3.78	
			16.536	1	12.3	1.50	0.3	5.54	
			18.672	1	12.7	1.00	0.3	3.81	
			18.786	1	9.8	1.00	0.3	2.94	
			19.033	1	9.5	1.50	0.3	4.28	
			19.292	1	9.7	1.00	0.3	2.91	
			20.912	1	10.5	1.50	0.3	4.73	
			22.408	1	10.8	2.00	0.3	6.48	
			24.672	1	12.4	1.00	0.3	3.72	
			24.999	1	9.0	1.20	0.3	3.24	
			27.700	1	7.4	5.00	0.3	11.10	
			28.226	1	12.1	2.8	0.3	10.16	
			28.392	1	9.7	2.6	0.3	7.57	
			29.115	1	10.0	2.50	0.3	7.50	
			29.185	1	9.7	1.60	0.3	4.66	
			29.740	1	8.5	2.7	0.3	6.89	
			30.272	1	9.0	2.2	0.3	5.94	
			31.025	1	7.0	1.90	0.3	3.99	
			31.703	1	11.0	2.00	0.3	6.60	
			32.269	1	10.0	1.80	0.3	5.40	
32.721	1	9.4	1.60	0.3	4.51				
33.102	1	10.0	3.5	0.3	10.50				
								Total=	126.23
	Hume Pipe								
C) Hume Pipe	Dia upto 600 mm =	m		3	10.00				30.00
	Dia from 600-900 mm =	m		6	10.00				60.00
	Dia above 900mm=	m		34	10.00				340.00

Quantity Summary of Dismantling of Existing Culvert::

Total Dismantling of Rubble stone masonry in cement mortar=	1656 cum
Total Dismantling of Reinforced cement concrete=	126 cum
Total Dismantling of up to 600 mm dia Hume Pipe=	30 cum
Total Dismantling of above 600 mm to 900 mm dia Hume Pipe=	60 cum
Total Dismantling of above 900 mm dia Hume Pipe=	340 cum



Site Clearance and Dismantling
Quantity calculation for dismantling of Flexible Pavement

From	To	Avg. Width (m)	Thickness of Bituminous Layer (m)	Quantity of Bituminous Layer to be dismantled (cum)	Thickness of Base Layer/Sub Base Layer to be dismantled (m)	Quantity of Base Layer for reuse (cum)
16000	16500	6.7	0.150	503	0.140	469
16500	17000	6.8	0.150	510	0.300	1020
17000	17500	6.7	0.130	436	0.080	268
17500	18000	6.7	0.100	335	0.300	1005
18000	18500	6.7	0.120	402	0.140	469
18500	19000	6.7	0.100	335	0.300	1005
19000	19500	6.8	0.130	442	0.150	510
19500	20000	6.7	0.110	369	0.360	1206
20000	20500	6.7	0.100	335	0.080	268
20500	21000	6.7	0.110	369	0.050	167.5
21000	21500	6.8	0.075	255	0.280	952
21500	22000	6.7	0.050	168	0.450	1507.5
22000	22500	6.7	0.130	436	0.025	83.75
22500	23000	6.7	0.080	268	0.340	1139
23000	23500	6.8	0.130	442	0.300	1020
23500	24000	6.7	0.070	235	0.300	1005
24000	24500	6.7	0.080	268	0.080	268
24500	25000	6.7	0.090	302	0.400	1340
25000	25500	6.7	0.040	134	0.260	871
25500	26000	6.8	0.090	306	0.400	1360
26000	26500	6.7	0.060	201	0.200	670
26500	27000	6.7	0.070	235	0.300	1005
27000	27500	6.7	0.100	335	0.140	469
27500	28000	6.8	0.110	374	0.090	306
28000	28500	6.7	0.070	235	0.260	871
28500	29000	6.7	0.040	134	0.200	670
29000	29500	6.7	0.080	268	0.440	1474
29500	30000	6.7	0.110	369	0.180	603
30000	30500	6.8	0.100	340	0.230	782
30500	31000	6.7	0.100	335	0.200	670
31000	31500	6.7	0.110	369	0.300	1005
31500	32000	6.7	0.100	335	0.150	502.5
32000	32500	6.7	0.160	536	0.300	1005
32500	33000	6.8	0.100	340	0.120	408
33000	33500	6.7	0.150	503	0.200	670
33500	34000	6.7	0.150	503	0.240	804
Total =				12255		27848

Total quantity for dismantling (Bituminous layer)=	12255	cum
Quantity of Dismantelled Bituminous Material(sqm) (Assume avg thickness 75mm)	163400	sqm
Total quantity for dismantling (Granular Layer)=	27848	cum
Quantity of Granular Material(sqm) (Assume avg thickness 150mm)	185655	sqm
Quantity of stone material for reuse (@ 60%) =	16709	cum



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
15950	0	4.96	0	62.06
15975	0	4.5	0	118.3
16000	3.06	1.81	38.2	78.91
16025	6.92	0.19	124.65	25.11
16050	3.51	0.12	130.33	3.99
16075	5.16	0	108.42	1.56
16100	2.24	0.36	92.57	4.56
16125	0.54	1.45	34.76	22.65
16150	0	9.52	6.72	137.13
16175	0	14.83	0	304.47
16200	0	10.92	0	321.99
16225	0	7.14	0	225.86
16250	0	5.06	0	152.56
16275	2.21	1.06	27.57	76.53
16300	5.34	0	94.09	13.4
16325	8.03	0	166.96	0
16350	9.12	0	214.25	0
16375	8.39	0	218.78	0
16400	7.7	0	201.01	0
16425	6.17	0	173.31	0
16450	4.65	0	135.32	0
16475	2.57	0	90.34	0.08
16500	0	3.64	32.15	45.54
16525	0	7.32	0	137.03
16550	0	5.71	0	162.99
16575	0	1.71	0	92.78
16600	2.66	0	33.22	21.35
16625	7.15	0	122.54	0
16650	9.23	0	204.66	0
16675	11.28	0	256.22	0
16700	7.31	0	232.54	0
16725	4.41	0.69	147.05	8.45
16750	4.31	0	108.97	8.49
16775	4.71	0.84	112.4	10.64
16800	7.17	0.01	148.33	10.77
16825	6.21	0	167.22	0.18
16850	2.95	0.14	114.39	1.75
16875	0.57	0.58	43.89	9.35
16900	0	4.3	6.59	60.6
16925	0.22	1.46	2.65	71.96
16950	4.19	0	55.07	18.4
16975	4.92	0	113.82	0.11
17000	2.97	0.25	110.26	2.4
17025	2.78	0.47	78.52	6.73
17050	0.19	4.72	36.99	65.05
17075	0.35	4.35	6.12	115.62
17100	0.06	4.29	4.76	107.89
17125	1.3	1.33	16.93	69.39
17150	4.87	1.37	76.98	35.86
17175	7.58	0	155.65	17.15
17200	4.64	0	156.5	0
17225	0.82	0.47	71.22	4.81
17250	6.3	10.8	94.72	112.11
17275	41.9	0	630.73	125.84



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
17300	18.71	0	757.72	0
17325	4.55	0.04	290.74	0.44
17350	0.02	8.31	55.65	104.78
17375	0	6.95	0.19	190.24
17400	3.35	0.48	49.39	87.8
17425	5.29	0.18	112.61	7.53
17450	8.39	0	170.81	2.31
17475	6.4	0	188.77	0
17500	3.52	47.21	127.21	505.47
17525	15.22	0	234.24	590.18
17550	19.66	0.2	436	2.55
17575	9.19	0	364.63	2.54
17600	4.1	0	164.98	0
17625	11.94	0	199.53	0
17650	25.53	0	468.59	0
17675	25.94	0	638.35	0
17700	24.08	0	621.28	0
17725	25.5	0	618.64	0
17750	11.58	0	460.64	0
17775	17.21	1.28	312.98	17.56
17800	4.58	6.5	230.86	111.1
17825	1.27	1.08	72.57	95.71
17850	4.23	0.01	68.82	13.65
17875	9.34	0	169.72	0.12
17900	5.81	0	191.93	0
17925	5.89	0	140.3	0
17950	10.34	0	204.06	0
17975	29.61	0	499.33	0
18000	35.56	0	814.52	0
18025	9.96	3.89	580.62	46.22
18050	14.44	0	314.06	38.55
18075	13.95	0	361.67	0
18100	11.2	0	314.37	0
18125	10.63	0.85	272.83	10.66
18150	6.33	0.03	212.05	11
18175	3.68	0	125.19	0.34
18200	5.47	0	113.25	0
18225	12.55	0	222.41	0
18250	10.02	5.61	282.07	70.16
18275	13.71	1.43	296.52	88.09
18300	8.87	0	280.93	18.08
18325	24.61	0.1	402.47	1.29
18350	21.48	0.03	547.6	1.62
18375	2.83	11.8	298.05	151.48
18400	0.49	9.32	41.05	266.54
18425	0.32	2.1	8.86	155.58
18450	9.04	0	115.79	27.65
18475	7.36	0.33	199.94	4.59
18500	5.09	0.84	155.01	14.71
18525	21.17	0	317.74	11.13
18550	9.95	0	384.73	0
18575	5.8	0	196.96	0
18600	2.55	3.06	103.9	35
18625	1.55	12.71	51.55	193.04




QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
18650	8.84	5.06	129.84	222.05
18675	37.31	0	576.89	63.22
18700	20.39	0	721.24	0
18725	13.2	0	419.87	0.12
18750	10.07	0	306.79	0.09
18775	0	8.56	131.25	88.24
18800	0	10.34	0	236.18
18825	1.34	0.09	16.23	130.29
18850	4.66	0	73.64	1.09
18875	4.79	0	116.77	0
18900	6.29	0	136.75	0
18925	13.47	0	243.98	0
18950	36.74	0	584.11	0
18975	48.92	0	1026.65	0
19000	7.24	0	819.54	0
19025	16.27	0	328.95	0
19050	137.03	0	2595.45	0
19075	76.38	0	2667.61	0
19100	56.07	0	1621.1	0
19125	58.96	0.1	1273.33	1.37
19150	23.06	0	880.54	1.39
19175	10.24	0	375.23	0
19200	35.63	0.33	537.05	4.23
19225	65.51	0.97	1264.26	16.16
19250	26.74	0.7	1131.01	21.07
19275	8.43	0	400.77	9.41
19300	28.11	0	426.29	0
19325	30.29	0	677.61	0
19350	29.37	0	729.91	0
19375	12.85	0	511.92	0
19400	8.57	0	251.34	0
19425	1.83	113.08	127.51	1544.8
19450	4.32	0.53	75.52	1201.73
19475	7.99	0	151.71	7.13
19500	8.77	0	206.26	0
19525	6.74	0	194.04	0
19550	4.48	0.04	134.71	0.52
19575	14.5	0	232.49	0.5
19600	26.59	0	580.12	0
19625	0.04	2.08	409.46	28.92
19650	34.84	6.56	545.91	94.93
19675	106.59	8.74	1699.68	197.1
19700	35.61	3.34	1394.61	178.03
19725	13.09	0	505.53	49.07
19750	21.01	0	417.81	0
19775	39.62	0	755.85	0
19800	31.47	0	888.62	0
19825	36.14	0	846.28	0
19850	93.14	0	1756.23	0
19875	10.67	0	1454.72	0
19900	12.29	0	298.03	0
19925	12.74	0.34	314.16	4.21
19950	10.66	0	292.5	4.22
19975	6.71	0.01	219.65	0.17



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
20000	12.47	1.68	262.76	18.32
20025	34.52	0	607.59	20.14
20050	138.1	0.02	2157.79	0.21
20075	91.53	0	2870.45	0.21
20100	16.9	0.13	1380.61	1.54
20125	2.73	0.01	263.45	1.55
20150	5.63	0	104.49	0.16
20175	3.24	0	105.28	0
20200	10.08	0	159.72	0
20225	14.35	0	303.33	0
20250	4.1	0.72	237	7.26
20275	16.46	0	268.86	8.08
20300	66.21	0	1000.11	0
20325	97.74	0	1965.1	0
20350	206.52	0	3606.5	0
20375	48.94	0	3008.1	0
20400	17.89	0	786.94	0
20425	17.77	0	431.33	0
20450	10.45	0	343.94	0
20475	27.94	81.81	447.02	1301.98
20500	60.32	0	1076.75	1096.22
20525	35.51	0	1197.9	0
20550	55.35	0	1135.71	0
20575	137.81	0	2414.42	0
20600	74.99	5	3121.04	55.71
20625	28.74	0	1627.31	49.8
20650	255.93	0	3971.96	0
20675	312.32	0	7196.75	0
20700	149.72	0	5775.5	0
20725	28.82	0	2231.81	0
20750	14.27	0	538.58	0
20775	23.13	0	467.45	0
20800	21.5	0	557.89	0
20825	39.88	0	789.88	0
20850	11.28	1.46	759.86	21.69
20875	21.9	0	448.12	21.87
20900	2.87	4.04	320.21	48.29
20925	5.82	60.57	108.59	807.6
20950	11.77	0	209.11	913.69
20975	55.7	0	735.68	0
21000	35.97	0	1027.93	0
21025	17.51	0	674.9	0
21050	21.75	0	503.87	0
21075	98.61	0	1593.76	0
21100	90.71	86.83	2439.1	1031.86
21125	15.28	0	1304.24	1117.47
21150	45.67	0	719.56	0
21175	31.6	0	914.56	0
21200	19.95	0.17	638.94	2.13
21225	20.45	0	505	2.07
21250	14.79	0	448.28	0
21275	54.49	0	1034.26	0
21300	113.48	0.01	1852.91	0.2
21325	12.44	0	1234.79	0.22



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
21350	7.86	0	243.19	0
21375	9.83	0	221.06	0
21400	14.04	0	298.35	0
21425	86.68	0	1259.06	0
21450	140.17	0	2835.61	0
21475	132.06	0	3402.8	0
21500	39.45	0	2178.77	0
21525	354	0	5954.98	0
21550	36.96	0	6004.32	0
21575	14.04	0	646.93	0
21600	55.11	5.16	841.79	65.4
21625	7.94	0	569.85	73.35
21650	5.32	3.99	159.52	53.91
21675	45.58	0	659.74	47.37
21700	10.69	0	767.15	0
21725	21.68	0	409.52	0
21750	5.27	0	336.77	0
21775	5.84	1.39	132.1	18.59
21800	0.99	0.18	65.64	24.08
21825	0.62	4.64	19.57	51.19
21850	7.42	4.85	104.47	114.3
21875	11.77	0	239.96	60.58
21900	16.68	0	355.69	0
21925	40.53	0	715.21	0
21950	2.41	2.34	620.43	24.38
21975	2.69	11.58	60.08	196.51
22000	30.36	0	422.56	149.04
22025	8.09	0	480.64	0
22050	12.56	0	256.95	0
22075	27.25	0	499.69	0
22100	77.03	0	1228.08	0
22125	30.77	0	1212.03	0
22150	7.4	0.05	454.54	0.66
22175	3.57	2.57	137.07	32.72
22200	16.01	0	219.36	36.14
22225	14.01	0	323.51	0
22250	3.3	6.03	214.29	77.05
22275	14.78	0	235.99	64.17
22300	4.83	0	254.78	0
22325	34.66	0	551.54	0
22350	27.62	0	789	0
22375	15.58	2.15	540	26.85
22400	3.23	86.88	224.61	1246.7
22425	2.96	5.49	66.78	1582.65
22450	21.1	0.11	261.74	73.3
22475	10.11	0	356.75	1.31
22500	7.63	0	222.61	0
22525	7.37	0	188.84	0
22550	39.07	0	584.16	0
22575	39.76	0	852.09	0
22600	16.95	0.98	610.79	12.79
22625	13.77	0	345.14	12.79
22650	14.61	75.42	331.02	1307.2
22675	19.03	85.02	418.18	2060.52




QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
22700	47.82	0	880.05	889.61
22725	17.15	0	857.23	0
22750	29.62	0	608.35	0
22775	41.32	0	914.23	0
22800	56.69	0	1225.1	0
22825	77.79	0	1680.94	0
22850	39.91	0	1471.2	0
22875	4.25	0.52	573.73	6.18
22900	7.99	2.02	166.66	25.47
22925	7.44	0	197.65	23.49
22950	9.88	0	216.51	0
22975	11.31	0	262.93	0
23000	16.68	0	345.77	0
23025	13.18	0	373.23	0
23050	22.87	0	450.6	0
23075	28.81	0	642.31	0
23100	44.13	0	907.64	0
23125	69.87	0	1410.78	0
23150	129.02	0	2425.15	0
23175	43.26	0	2177.35	0
23200	12.96	0	806.82	0
23225	35.5	0	732.35	0
23250	12.79	0	630.37	0
23275	35.29	2.08	540.52	27.11
23300	19.93	0.36	610.91	31.95
23325	14.48	0	388.72	4.76
23350	22.18	0	435.91	0
23375	41.09	0	790.81	0
23400	18.77	0.23	850.22	2
23425	21.11	0	533.84	1.86
23450	18.56	0	504.45	0
23475	21.68	0	496.39	0
23500	8.86	0	374.9	0
23525	10.37	0	238.3	0
23550	4.72	0	186.33	0
23575	9.88	0	179.31	0
23600	11.53	0	265.42	0
23625	5.66	0	200.58	0.05
23650	13.26	0	224.03	0.05
23675	28.63	0	492.98	0
23700	32.21	0	702.23	0
23725	15.22	0	577.42	0
23750	10.54	0	325.86	0
23775	7.43	0	225.05	0
23800	13.88	0	266.37	0
23825	4.95	0	241.22	0.03
23850	9.04	0	177.44	0.03
23875	9.95	0	239.1	0
23900	9.63	0.16	235.66	2.04
23925	12.98	0	276.22	2.02
23950	8.26	0	265.38	0
23975	12.14	0	254.98	0
24000	15.73	0	348.41	0
24025	15.44	0	389.67	0




QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
24050	11.07	0	331.42	0
24075	7.49	1.58	232.05	19.79
24100	11.36	2.13	235.65	46.47
24125	5.37	0	208.28	26.95
24150	6.53	1.06	142.3	13.77
24175	20.88	0.02	318	14.26
24200	9.14	0	349.2	0.31
24225	25.2	0	402.71	0
24250	20.71	0	571.28	0
24275	50.4	0	888.92	0
24300	57.43	0	1347.89	0
24325	7.96	0	834.81	0
24350	7.44	0	198.18	0
24375	8.58	0	201.78	0
24400	11.04	0	245.25	0.02
24425	2.63	2.16	170.83	26.98
24450	0.21	10.99	36.01	163.13
24475	2.28	5.34	33.9	193.26
24500	8.27	0	137.64	61.43
24525	15.06	0	293.21	0
24550	18.09	0	409.63	0
24575	14.42	0	402.68	0
24600	9.19	0	294.97	0
24625	4.78	0.06	175.47	0.76
24650	20.02	0.21	327.45	3.44
24675	9.77	0	390.69	2.69
24700	5.75	0	195.19	0.02
24725	10.21	0	200.76	0
24750	4.31	2.72	180.12	34.15
24775	0	9.37	52.07	155.97
24800	0	12.9	0	280.02
24825	0.73	4.31	9.14	215.2
24850	2.11	4.42	35.5	109.08
24875	6.33	0.43	104.14	60.58
24900	13.95	0	239.28	5.38
24925	24.83	0.33	443.22	4.04
24950	20	0	522.55	4.05
24975	11.45	0	390.97	0
25000	18.3	0	371.83	0
25025	17.55	0.33	448.09	4.13
25050	33.76	2.32	603.77	33.97
25075	15.1	2.28	529.97	59.26
25100	3.64	0.89	234.25	39.58
25125	18.86	0.32	287.12	15.16
25150	38.98	0	741.34	3.93
25175	27.1	0.01	846.53	0.13
25200	7.53	0.48	441.57	6.17
25225	3.23	0.5	136.31	12.2
25250	54.5	0.34	730.28	10.46
25275	82.07	4.93	1496.34	69.28
25300	6.44	9.31		
25325	0.3	3.23	84.22	
25350	4.82	4.14	54.81	94.36
25375	3.99	0.14	107.51	63.4



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
25400	72.43	3.06	1137.47	39.16
25425	70.39	0.08	1785.32	39.23
25450	73.58	0	1799.67	0.99
25475	46.3	0	1477.66	0
25500	127.73	0	1783.23	0
25525	60.24	0	1807.58	0
25550	56.24	0	1291.27	0
25575	15.12	0.01	892.05	0.13
25600	23.73	0	485.59	0.13
25625	21.59	0	566.48	0
25650	5.77	0.03	342.08	0.38
25675	2.19	2.76	103.37	34.67
25700	5.62	0	106.94	34.16
25725	16.41	0	278.23	0
25750	11.37	0	347.15	0
25775	22.77	1.05	426.71	13.12
25800	2.13	0.42	312.78	18.37
25825	3.38	0	70.22	5.05
25850	8.27	0	147.76	0
25875	7.08	0	192.19	0
25900	12.75	0	249.66	0
25925	9.38	0	281.81	0
25950	11.08	0	256.4	0
25975	7.61	34.17	233.64	427.08
26000	6.2	0	172.13	450.58
26025	1.89	0.25	101.82	3.22
26050	10.26	0	146.96	3.21
26075	5.89	1.53	200.41	20.41
26100	14.52	0	258.53	21.59
26125	23.44	0	464.32	0
26150	9.78	0.82	349.31	10.57
26175	11.61	0	226.08	10.56
26200	6.04	0	215.89	0
26225	3.57	0.05	120.66	0.69
26250	19.9	0	315.74	0.72
26275	8.25	0	335.95	0
26300	38.4	0	503.57	0
26325	13.14	0	631.22	0
26350	12.75	0	323.7	0
26375	50.73	0	817.63	0
26400	39.18	0	1253.16	0
26425	4.73	0.1	618.43	1.06
26450	1.67	0.03	83.19	1.39
26475	0.53	4.18	27.4	46.93
26500	2.22	0	34.47	51.86
26525	2.1	0.13	55.6	1.52
26550	1.93	0.02	51.32	1.75
26575	3.83	0	69.66	0.35
26600	12.78	0	199.66	0
26625	15.46	0	352.94	0
26650	26.18	0	530.14	0
26675	15.14	0	565.51	0
26700	23.41	0	502.21	0
26725	16.93	0.26	465.53	3.21




QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
26750	5.15	0	260.83	3.23
26775	5.07	0.02	0	0
26800	20.66	0.68	291.75	8.95
26825	49.72	0	870.98	8.53
26850	62.39	0	1624.67	0
26875	199.89	0	3632.87	0
26900	40.95	0	3058.73	0
26925	26.74	0	860.26	0
26950	143.37	0	2183.48	0
26975	83.88	0	2840.62	0



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
27000	40.39	0.26	1375.53	3.49
27025	131.81	0	1870.54	3.65
27050	259.44	0	4519.04	0
27075	126.83	0	4888.75	0
27100	13.83	0	2017	0
27125	140.25	0	2325.48	0
27150	25.96	0	2517.56	0.11
27175	23.85	19.69	684.6	180.33
27200	26.61	5.63	572.07	390.2
27225	39.67	0.15	413.34	2.28
27250	30.93	0	859.67	1.87
27275	11.5	0	546.99	0
27300	12.36	0	313.74	0
27325	5.78	0	227.94	0
27350	7.55	0	166.7	0
27375	12.83	0	254.74	0
27400	14.32	0	339.39	0
27425	19.84	0	409.04	0
27450	104.75	0	1371.92	0
27475	73.23	0	2175.08	0
27500	57.98	0	1829.82	0
27525	0	0	839.91	0
27550	43.23	0	641.96	0
27575	53.28	0	1241.92	0
27600	11.01	0.01	707.27	0.14
27625	57.47	1.26	736.17	16.96
27650	69.43	0	1451.08	16.44
27675	8.68	0.15	1044.4	1.73
27700	18.92	0	392.86	1.54
27725	39.32	0	809.43	0
27750	9.79	0.03	613.8	0.37
27775	27.02	0.27	460.05	3.71
27800	27.99	0	625.45	3.31
27825	41.98	0	741.98	0
27850	32.93	0	816.87	0
27875	10.95	0	540.52	0
27900	0.74	0.46	146.18	5.74
27925	5.71	0	80.69	5.74
27950	23.28	0	362.38	0
27975	40.62	0	798.7	0
28000	13.24	0.05	682.29	0.66
28025	10.29	0	295.89	0.66
28050	31.42	0	525.76	0
28075	41.41	0	910.35	0
28100	30.93	0	904.2	0
28125	42.97	0	923.8	0
28150	25.09	0	857.21	0
28175	4.64	0	431.19	0
28200	13.31	0	221.32	0
28225	10.05	0	114.49	0
28250	10.28	0	245.28	0
28275	12.37	0	283.18	0
28300	11.98	0.04	310.47	0.48
28325	16.71	0	376.37	0.46




QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
28350	11.35	0.05	365.5	0.67
28375	15.6	0	347.33	0.67
28400	5.17	0	267.57	0
28425	6.22	0	143.38	0
28450	18.69	0	219.28	0
28475	9.73	0	332.12	0
28500	14.63	0	304.47	0
28525	37.11	0	593.8	0
28550	8.4	0	519.73	0
28575	6.48	67.54	187.76	783.32
28600	7.13	0.38	173.95	634.76
28625	5.87	0	162.54	4.85
28650	5.25	0	138.83	0.08
28675	16.93	0	278.59	0
28700	25.44	0	531.3	0
28725	21.17	0	579.2	0
28750	12.54	0	411.88	0
28775	18.75	0	388.61	0
28800	2.58	6.58	266.62	82.26
28825	10.71	2.47	156.36	123.42
28850	34.83	0.12	542.55	33.69
28875	3.22	3.86	507.52	44.83
28900	14.09	0	189.79	0
28925	36.35	0	686.14	0
28950	8.95	2.37	566.25	29.69
28975	23.78	0	409.06	29.69
29000	12.74	0	447.75	0
29025	12.34	0	304.65	0
29050	9.05	0	262.43	0
29075	23.03	0	386.17	0
29100	21.17	0	527.4	0
29125	19.99	0	510.13	0
29150	7.07	0	340.12	0
29175	5	0	149.32	0
29200	3.56	2.94	108.86	36.32
29225	8.05	5.14	145.18	101
29250	20.44	34.79	353.68	508.59
29275	15.12	0.25	413.55	536.3
29300	23.48	0	443.62	3.32
29325	28.4	0	633.89	0.1
29350	38.94	0	841.78	0.09
29375	17.31	0	703.15	0
29400	21.15	0	476.67	0
29425	4.65	0.97	309.49	12.48
29450	17.96	43.11	277.46	631.64
29475	57.82	3.3	940.08	622.56
29500	15.89	0	954.95	28.25
29525	40.58	0	756.93	0
29550	30.12	0	888.39	0
29575	22.99	0	668.69	0
29600	24.5	1.63	302.46	16.23
29625	16.48	0	512.5	20.01
29650	41.87	0	698.37	0
29675	15.04	0	668.73	0



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
29700	19.66	0	433.75	0
29725	11.73	0	392.35	0
29750	10.26	0	273.27	0
29775	13.5	0	294.29	0
29800	28.39	0	518.11	0
29825	16.46	0	565.53	0
29850	12.08	0	364.94	0
29875	19.23	0	395.11	0
29900	11.54	0	384.59	0
29925	9.53	0	263.21	0
29950	5.69	0	190.31	0
29975	5.7	0	142.36	0
30000	8.07	0	172.17	0
30025	11.21	0	289.39	0
30050	12.32	0	574.12	0
30075	15.11	0	342.875	0
30100	17.32	0	405.375	0
30125	20.14	0	468.25	0
30150	16.38	0	456.5	0
30175	15.22	0	395	0
30200	10.76	0	324.75	0
30225	9.65	0	255.125	0
30250	14.32	0	299.625	0
30300	32.09	0	425.08	0
30325	20.61	0	641.28	0
30350	22.43	0	534.72	0
30375	31.21	0	670.53	0
30400	23.87	0	688.54	0
30425	10.5	0	429.72	0
30450	5.13	0	199.54	0
30550	9.99	0	106.62	0
30575	15.06	0	313.11	0
30600	19.8	0	435.71	0
30625	15.65	0	443.04	0
30650	17.35	0	412.5	0
30675	12.62	0	374.69	0
30700	18.2	0	385.32	0
30725	24.57	0.64	534.63	7.99
30750	20.88	0.97	568.04	20.08
30775	9.62	0.23	384.74	15.3
30800	11.17	0.65	274.63	10.78
30825	9.44	29.76	124.86	287.94
30850	10.59	0	261.28	290.02
30875	7.76	0	231.14	0
30900	19.16	0	329.72	0
30925	27.35	0	539.39	0
30950	11.07	0	447.19	0
30975	5.01	0.14	196.08	1.85
31000	14.79	0	247.5	1.76
31025	8.92	0	296.45	0
31050	9.22	0	226.83	0
31075	5.56	0	184.83	0
31100	14.88	0	275.49	0
31125	15.75	0	208.89	0




QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
31150	11.83	0	367.69	0
31175	11.3	0	289.18	0
31200	19.82	0	381.95	0
31225	7.96	0.93	306.44	12.84
31250	9.32	0	205.78	12.41
31275	10.77	0	255.57	0
31300	7.09	0	227.79	0
31325	10.13	0	221.22	0
31350	11.08	0	262.56	0
31375	12.26	0	274.73	0
31400	25.37	0	439.91	0
31425	13.76	0	469.05	0
31450	7.98	0.26	270.84	3.29
31475	8.36	0	204.28	3.29
31500	30.4	52.8	484.44	659.97
31525	15.61	0	575.04	659.97
31550	29.42	0	558.15	0
31575	27.51	15.57	669.28	157.48
31600	48.99	0	943.88	1579.33
31625	28.64	40.07	975.18	494.54
31650	2.43	0.09	445.71	276.19
31675	76.99	0	1312.31	0
31700	11.65	15.57	1243.7	157.48
31725	51.84	0	771.68	204.27
31750	49.99	0	1165.24	0
31775	80.63	0.04	1695.64	0.54
31800	38.45	5.9	1450.52	72.81
31825	19.12	12.07	246.94	141.76
31850	98.27	1.34	1488.51	174.69
31875	49.82	7.59	1880.79	127.56
31900	16.63	1.34	830.63	174.69
31925	19.22	7.59	448.15	127.56
31950	72.77	0	1109.26	1100.42
31975	17.85	0	1003.55	0
32000	14.31	0.52	383.35	6.84
32025	12.66	0	327.58	6.75
32050	4.71	1.34	209.85	174.69
32075	6.8	7.59	145.7	127.56
32100	10.23	0.04	131.2	0.54
32125	17.87	0	361.41	0.52
32150	7.51	0	317.22	0
32175	12.13	0	239.75	0
32200	17.07	0	334.42	0
32225	18.98	0	410.47	0
32250	10.67	0	360.22	0
32275	12.97	0	292.9	0
32300	10.22	0.52	286.2	6.84
32325	6.63	1.34	209.59	174.69
32350	4.54	7.59	139.59	127.56
32375	17.18	1.25	260.5	178.35
32400	14.12	0	381.57	16.07
32425	12.45	0.03	334.82	0.45
32450	12.45	0.03	334.82	0.45
32475	12.78	0	160.28	0



QUANTITY CALCULATION OF CUTFILL

For Soil & Ordinary Rock:-

Chainage (m)	Cut Area (sqm)	Fill Area (sqm)	Earthwork - Cut Volume (cum)	Earthwork - Fill Volume (cum)
32500	22.3	0	438.53	0
32525	15.2	0	466.81	0
32550	8.3	1.13	275.64	14.82
32575	57.55	7.59	789.87	127.56
32600	35.89	0	1141.34	152
32625	11.13	0	602.71	0
32650	5.75	0	213.9	0
32675	15.24	0	268.9	0
32700	20.69	0	470.72	0
32725	10.23	0	397.37	0
32750	14.92	0	314.44	0
32775	50.73	1.34	624.13	174.69
32800	24	7.59	867.93	127.56
32825	8.08	1.25	352.73	180.26
32850	15.28	0	283.68	190.32
32900	67.57	0	884.06	0
32925	155.35	0	2585.03	0
32950	73.5	213.82	2482.09	3720.84
32975	46.6	0	1464.46	2847.64
33000	139.86	0.23	2005.51	3.13
33025	72.55	0	2531.43	2.98
33050	34.4	0	1461.32	0.04
33075	35.6	0	931.5	0
33100	38.92	0	486.5	0
Total =			4,02,408	47,996

<i>Subgrade requirement For Project Road</i>	
TCS-04	3630
TCS-07	1535
TCS-08	230
TCS-05	411
TCS-06	380
TCS-02A	2140
TCS-01	908
TCS-03	40800
Busbay (2 Lane)	1062
TCS-02	1995
TCS-03A	5009
Total =	58098

Scarified Bituminous and Granular Material(A)=	40103	cum
Subgrade Quantity at Rural Section(B)	58098	cum
Total Earthwork in cutting(C) =	402408	cum
Actual earthwork in soil(C-A-B)=	3,62,304	cum

Assume 20% total cutting Volume for Ordinary Rock C	72,461	cum
Earthwork In soil =	2,89,843	cum
Earthwork in filling =	47,996	cum
Total Earthwork in filling =	47,996	cum

Using 40% of cutting material for filling earthworks in embankment
 Earthwork used from Roadway Cutting Material= 144922 cum
 So no Earthwork required for embankment const from borrowpit ::



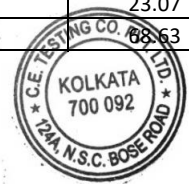

Variable Declaration**Earthwork**

SI No	Variable Description	Variable	Dimension	Unit
1	Total Earthwork In Cutting	tot_cut	362304.000	cum
2	Total Earthwork In Filling (Consider Only Embankment)	tot_fill	47996.000	cum
3	Percentage of Rock	per_rock	20.000	percent



Calculation of Extra Widening

	Start chainage of arc	End chainage of arc	Chord length (m)	Width	Transition length	Total area for extra-widening (in Arc Portion) (sqm.)	Total area for extra-widening (in Transition Portion)	Total area for extra-widening (Sqm.)
Arc	16701.110m	16716.868m	15.758	0.6	90	9.45	54	63.45
Arc	16879.294m	16884.222m	4.928	1.2	35	5.91	42	47.91
Arc	16991.377m	17008.707m	17.331	1.5	20	26.00	30	56.00
Arc	17070.814m	17117.350m	46.537	1.2	40	55.84	48	103.84
Arc	17205.311m	17241.714m	36.402	1.5	30	54.60	45	99.60
Arc	17357.320m	17397.722m	40.402	1.5	20	60.60	30	90.60
Arc	17459.633m	17474.343m	14.71	0.9	30	13.24	27	40.24
Arc	17588.509m	17599.357m	10.848	1.2	35	13.02	42	55.02
Arc	17675.616m	17783.728m	108.113	1.2	25	129.74	30	159.74
Arc	17901.650m	17919.296m	17.646	1.5	30	26.47	45	71.47
Arc	18037.183m	18047.302m	10.118	1.5	30	15.18	45	60.18
Arc	18198.096m	18204.047m	5.95	0.6	25	3.57	15	18.57
Arc	18320.680m	18341.102m	20.422	0.6	35	12.25	21	33.25
Arc	18416.440m	18454.847m	38.407	1.5	25	57.61	37.5	95.11
Arc	18514.794m	18520.170m	5.376	0.9	25	4.84	22.5	27.34
Arc	18587.113m	18591.291m	4.178	0.9	25	3.76	22.5	26.26
Arc	18744.395m	18758.384m	13.99	1.5	20	20.99	30	50.99
	18809.765m	18896.786m	87.021	0.9	15	78.32	13.5	91.82
	18937.046m	18946.141m	9.095	1.5	25	13.64	37.5	51.14
	18993.595m	19033.390m	39.795	1.5	20	59.69	30	89.69
	19120.021m	19171.313m	51.292	1.2	35	61.55	42	103.55
	19265.274m	19316.512m	51.238	0.9	30	46.11	27	73.11
	19371.607m	19400.033m	28.426	1.2	15	34.11	18	52.11
	19444.949m	19491.667m	46.717	1.2	15	56.06	18	74.06
	19527.393m	19550.507m	23.115	0.9	15	20.80	13.5	34.30
	19595.497m	19635.196m	39.699	1.5	20	59.55	30	89.55
	19687.620m	19727.591m	39.97	1.5	30	59.96	45	104.96
	19838.889m	19881.346m	42.457	1.5	25	63.69	37.5	101.19
	19981.747m	19997.132m	15.385	1.2	20	18.46	24	42.46
	20109.917m	20114.024m	4.107	1.2	25	4.93	30	34.93
	20154.919m	20201.412m	46.493	1.5	15	69.74	22.5	92.24
	20237.479m	20253.319m	15.84	1.5	15	23.76	22.5	46.26
	20287.431m	20474.045m	186.614	0.9	15	167.95	13.5	181.45
	20599.101m	20635.815m	36.714	1.5	25	55.07	37.5	92.57
	20834.460m	20868.451m	33.991	1.5	20	50.99	30	80.99
	20941.295m	20983.172m	41.877	1.2	20	50.25	24	74.25
	21026.595m	21077.130m	50.535	0.6	20	30.32	12	42.32
	21137.937m	21168.009m	30.073	0.9	25	27.07	22.5	49.57
	21253.000m	21263.871m	10.871	1.5	15	16.31	22.5	38.81
	21295.179m	21334.238m	39.059	1.5	15	58.59	22.5	81.09
	21506.388m	21545.145m	38.757	1.5	15	58.14	22.5	80.64
	21610.682m	21627.985m	17.303	1.5	20	25.95	30	55.95
	21672.720m	21694.680m	21.961	1.5	15	32.94	22.5	55.44
	21777.789m	21818.726m	40.937	1.5	20	61.41	30	91.41
	21948.610m	21966.074m	17.463	1.5	20	26.19	30	56.19
	22043.733m	22047.957m	4.224	1.2	15	5.07	18	23.07
	22093.990m	22131.178m	37.188	1.2	20	44.63	24	68.63



22201.462m	22210.664m	9.202	1.5	30	13.80	45	58.80
22270.712m	22305.453m	34.741	1.5	30	52.11	45	97.11
22405.360m	22458.318m	52.957	1.2	25	63.55	30	93.55
22506.509m	22518.409m	11.9	1.2	20	14.28	24	38.28
22558.599m	22641.383m	82.784	1.2	20	99.34	24	123.34
22679.055m	22757.421m	78.366	0.6	15	47.02	9	56.02
22880.505m	22895.113m	14.609	1.5	25	21.91	37.5	59.41
22953.228m	23003.228m	50	0.6	15	30.00	9	39.00
23048.987m	23156.604m	107.617	0.6	15	64.57	9	73.57
23188.274m	23218.531m	30.258	1.5	20	45.39	30	75.39
23257.156m	23343.744m	86.588	0.9	15	77.93	13.5	91.43
23389.792m	23415.696m	25.904	1.5	20	38.86	30	68.86
23461.795m	23572.544m	110.748	0.6	15	66.45	9	75.45
23606.009m	23701.625m	95.617	0.9	15	86.06	13.5	99.56
23743.680m	23748.059m	4.379	0.9	15	3.94	13.5	17.44
23817.566m	23841.288m	23.722	0.9	25	21.35	22.5	43.85
23890.560m	23903.545m	12.985	0.9	20	11.69	18	29.69
24144.144m	24203.920m	59.776	0.9	30	53.80	27	80.80
24329.981m	24344.039m	14.059	1.2	20	16.87	24	40.87
24468.814m	24483.275m	14.461	1.2	35	17.35	42	59.35
24550.101m	24557.200m	7.099	0.9	30	6.39	27	33.39
24624.048m	24700.084m	76.036	0.9	20	68.43	18	86.43
24749.284m	24770.083m	20.8	0.6	15	12.48	9	21.48
24889.519m	24932.979m	43.459	0.9	30	39.11	27	66.11
25053.000m	25059.216m	6.216	1.5	25	9.32	37.5	46.82
25085.663m	25243.193m	157.53	0.6	15	94.52	9	103.52
25263.990m	25286.770m	22.78	1.2	20	27.34	24	51.34
25340.999m	25374.431m	33.432	1.5	20	50.15	30	80.15
25491.637m	25524.686m	33.049	1.5	25	49.57	37.5	87.07
25670.619m	25692.551m	21.932	1.2	20	26.32	24	50.32
25820.808m	25834.094m	13.286	0.9	30	11.96	27	38.96
25898.339m	25909.968m	11.628	0.9	25	10.47	22.5	32.97
26012.187m	26034.413m	22.227	1.5	20	33.34	30	63.34
26074.633m	26084.142m	9.509	1.5	20	14.26	30	44.26
26132.748m	26166.078m	33.33	1.5	25	50.00	37.5	87.50
26229.776m	26237.187m	7.411	1.2	15	8.89	18	26.89
26275.959m	26292.623m	16.664	1.2	20	20.00	24	44.00
26387.583m	26452.322m	64.739	1.2	35	77.69	42	119.69
26498.513m	26526.759m	28.246	0.9	15	25.42	13.5	38.92
26547.150m	26582.067m	34.917	1.5	20	52.38	30	82.38
26652.330m	26671.545m	19.215	1.5	20	28.82	30	58.82
26692.331m	26746.084m	53.753	0.9	15	48.38	13.5	61.88
26784.641m	26788.305m	3.664	1.5	25	5.50	37.5	43.00
26840.070m	26852.536m	12.466	1.5	25	18.70	37.5	56.20
26888.971m	26947.036m	58.065	0.6	15	34.84	9	43.84
26996.065m	27028.927m	32.861	1.5	25	49.29	37.5	86.79
27088.864m	27154.050m	65.186	1.5	25	97.78	37.5	135.28
27201.500m	27215.284m	13.784	1.5	20	20.68	30	50.68
27277.443m	27287.199m	9.756	1.2	20	11.71	24	35.71
27420.063m	27445.107m	25.045	1.2	20	30.05	24	54.05
27498.198m	27536.191m	37.994	1.5	30	56.99	45	101.99
27586.310m	27630.784m	44.474	1.2	20	53.37	24	77.37
27676.366m	27704.131m	27.765	1.5	25	41.65	37.5	79.15
27798.609m	27837.262m	38.653	1.5	25	57.98	37.5	95.48
28159.629m	28167.513m	7.884	1.5	15	11.83	22.5	34.33



	28199.431m	28228.648m	29.217	1.5	15	43.83	22.5	66.33
	28288.539m	28417.225m	128.686	0.9	15	115.82	13.5	129.32
	28442.780m	28454.524m	11.744	1.5	20	17.62	30	47.62
	28509.734m	28539.389m	29.655	1.2	15	35.59	18	53.59
	28576.639m	28586.342m	9.702	1.2	15	11.64	18	29.64
	28657.914m	28658.414m	0.5	0.9	30	0.45	27	27.45
	28725.308m	28748.431m	23.123	0.6	15	13.87	9	22.87
	28820.468m	28826.869m	6.401	1.2	20	7.68	24	31.68
	28879.246m	28896.640m	17.394	1.5	30	26.09	45	71.09
	28994.186m	29096.806m	102.62	0.6	15	61.57	9	70.57
	29163.090m	29182.215m	19.124	0.9	25	17.21	22.5	39.71
	29279.569m	29283.244m	3.675	1.2	40	4.41	48	52.41
	29401.382m	29455.002m	53.619	0.6	15	32.17	9	41.17
	29493.059m	29512.990m	19.932	1.2	20	23.92	24	47.92
	29581.063m	29588.777m	7.714	0.9	20	6.94	18	24.94
	29648.863m	29657.781m	8.918	0.9	25	8.03	22.5	30.53
	29839.618m	29847.003m	7.385	0.6	35	4.43	21	25.43
	30023.325m	30074.928m	51.603	0.9	15	46.44	13.5	59.94
	30117.597m	30129.708m	12.11	1.5	25	18.17	37.5	55.67
	30216.475m	30234.055m	17.58	0.6	15	10.55	9	19.55
	30264.532m	30283.779m	19.247	1.2	15	23.10	18	41.10
	30300.279m	30332.729m	32.45	0.6	15	19.47	9	28.47
	30444.415m	30456.684m	12.269	0.9	15	11.04	13.5	24.54
	30499.635m	30532.837m	33.202	1.5	20	49.80	30	79.80
	30783.028m	30844.443m	61.415	0.9	25	55.27	22.5	77.77
	30915.611m	30939.402m	23.791	1.2	40	28.55	48	76.55
	31097.358m	31131.169m	33.811	1.5	20	50.72	30	80.72
	31206.632m	31229.984m	23.352	1.2	20	28.02	24	52.02
	31271.321m	31305.165m	33.844	1.2	20	40.61	24	64.61
	31363.842m	31408.400m	44.558	0.9	30	40.10	27	67.10
	31557.593m	31569.654m	12.062	0.9	20	10.86	18	28.86
	31640.359m	31673.704m	33.344	1.5	20	50.02	30	80.02
	31730.928m	31748.307m	17.379	0.9	25	15.64	22.5	38.14
	31800.042m	31813.210m	13.168	0.6	15	7.90	9	16.90
	31844.836m	31866.318m	21.482	0.6	15	12.89	9	21.89
	31961.905m	31970.463m	8.558	1.2	35	10.27	42	52.27
	32020.990m	32030.412m	9.423	0.9	15	8.48	13.5	21.98
	32081.379m	32102.102m	20.722	0.9	25	18.65	22.5	41.15
	32188.305m	32216.885m	28.58	1.2	35	34.30	42	76.30
	32253.591m	32307.397m	53.806	0.6	15	32.28	9	41.28
	32363.114m	32379.989m	16.875	0.6	15	10.13	9	19.13
	32436.865m	32445.330m	8.465	0.9	25	7.62	22.5	30.12
	32555.143m	32561.545m	6.402	1.2	40	7.68	48	55.68
	32636.636m	32697.773m	61.137	1.2	35	73.36	42	115.36
	32791.815m	32811.650m	19.834	1.2	40	23.80	48	71.80
	32872.761m	32883.831m	11.07	1.2	15	13.28	18	31.28
	32919.476m	32940.356m	20.88	1.2	20	25.06	24	49.06
	32988.357m	32996.234m	7.877	1.2	20	9.45	24	33.45
	33053.854m	33088.177m	34.323	1.5	20	51.48	30	81.48
								9241.42

Total Area of Extra Widening=

9241 Sqm



Variable Declaration

Extra Widening on Flexible Pavement

SI No	Variable Description	Variable	Dimension	Unit
1	Total Area of Extra Widening	ew_area	9241.000	m
2	BC	bc	0.040	m
3	DBM	dbm	0.080	m
4	WMM-I	wmm1	0.125	m
5	WMM-II	wmm2	0.125	m
6	GSB	gsb	0.200	m
7	Reuseble GSB percentage	gsb_per	36.600	percentage




RCC Covered Drain

Chainage (m)		Length of CD	Net Length (m)	TCS No.	Side	Size
From	To					
16300	16850	3.96	1092.1	TCS-1	Both	1.75m
16970	17200	2.7	454.6	TCS-6	Both	1.0m
23850	24000	2.6	147.4	TCS-7	Valley	1.0m
25750	25850	0	100.0	TCS-7	Valley	1.0m
28370	28850	2.6	477.4	TCS-7	Valley	1.0m
30850	31050	2.7	197.3	TCS-7	Valley	1.0m
Total =			2469			

RCC Cover Drain(1.75m)

1092 m

RCC Cover Drain(1.0m)

1377 m

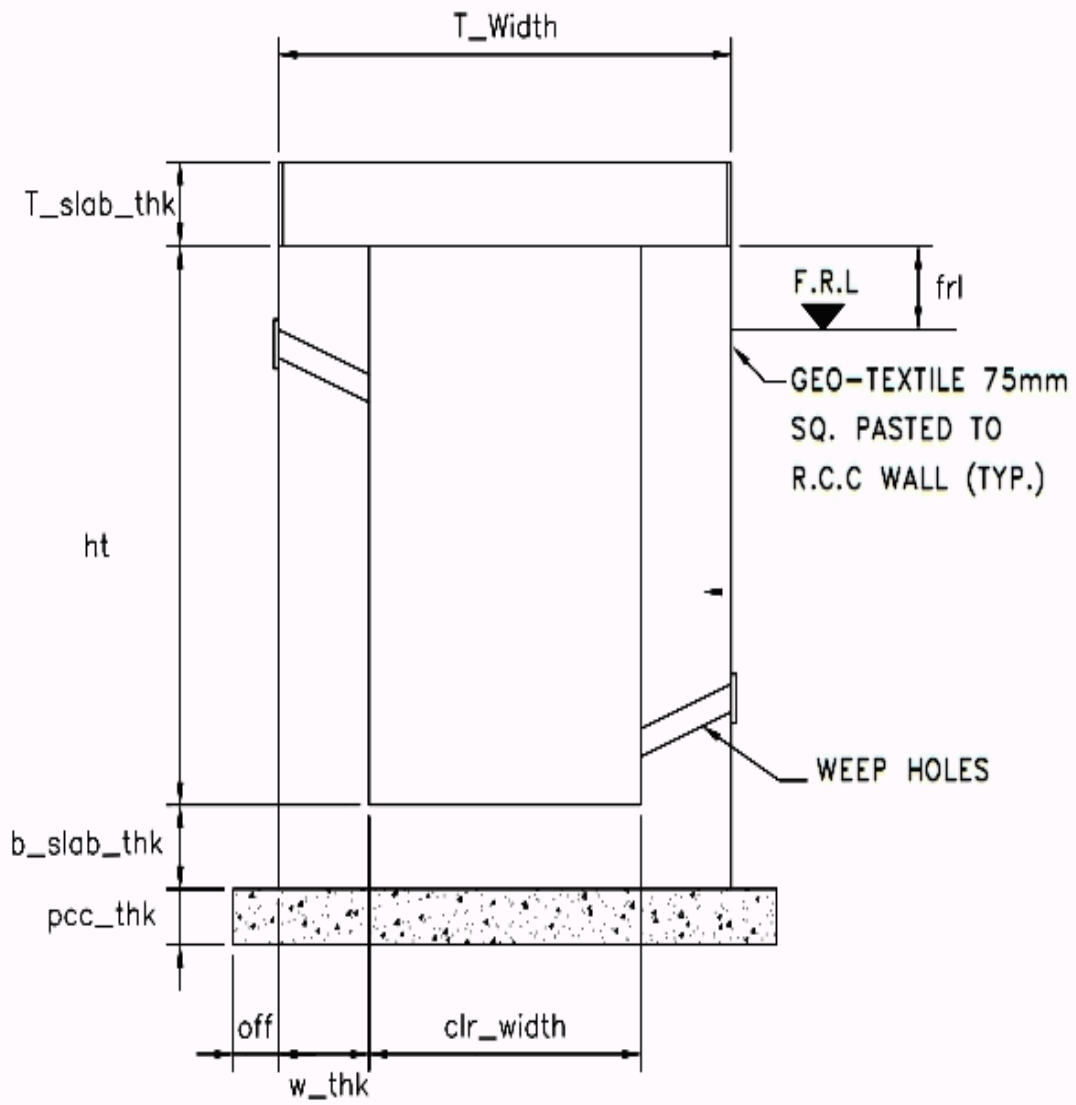


Variable Declaration

RCC Cover Drain 1.0m

SI No	Variable Description	Variable	Dimension	Unit
1	Top Width	t_width	1.750	m
2	Top Slab Thickness	t_slab_thk	0.125	m
3	Height of Drain	ht	0.900	m
4	Bottom Slab Thickness	b_slab_thk	0.150	m
5	Side Wall Thickness	w_thk	0.200	m
6	Foundation PCC thickness	pcc_thk	0.100	m
7	Foundation PCC Offset	off	0.100	m
8	Length	l	1377.000	m
9	Reinforcement Per Cum RCC	s	0.050	MT/Cum RCC
10	Finished Road Level	fri	0.300	m

Variable Declaration

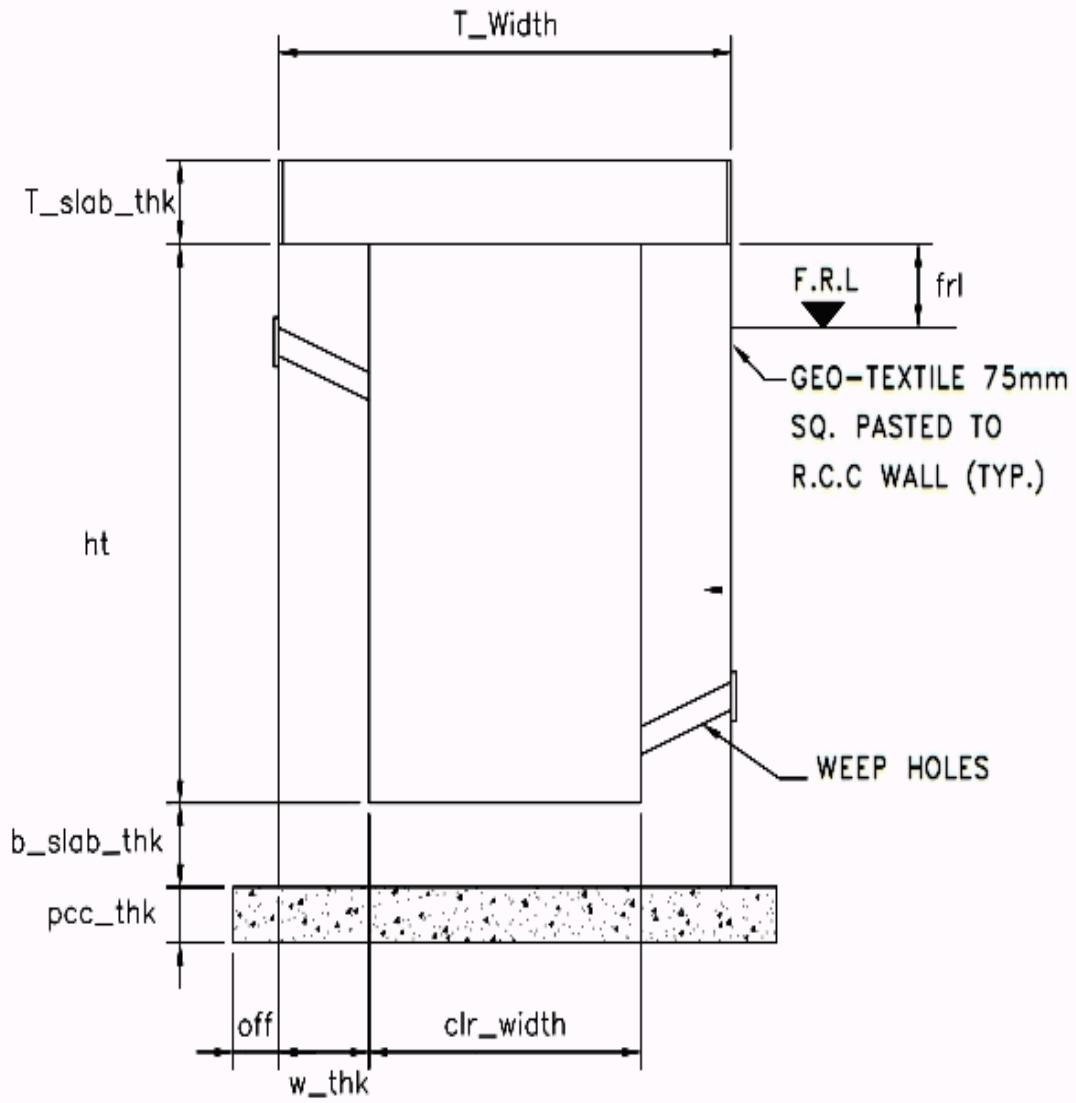


Variable Declaration

RCC Cover Drain 1.75m

SI No	Variable Description	Variable	Dimension	Unit
1	Top Width	t_width	1.750	m
2	Top Slab Thickness	t_slab_thk	0.125	m
3	Height of Drain	ht	0.900	m
4	Bottom Slab Thickness	b_slab_thk	0.150	m
5	Side Wall Thickness	w_thk	0.200	m
6	Foundation PCC thickness	pcc_thk	0.100	m
7	Foundation PCC Offset	off	0.100	m
8	Length	l	1092.000	m
9	Reinforcement Per Cum RCC	s	0.050	MT/Cum RCC
10	Finished Road Level	frl	0.300	m

Variable Declaration



Trapezoidal Drain and Chut Drain

Chainage (m)		Length of CD	Net Length (m)	TCS No.	Side
From	To				
17475	17525	0	50.0	TCS-4	Hill
17525	18225	7.9	692.1	TCS-3	Hill
18225	18275	0	50.0	TCS-4	Hill
18350	18410	2.6	57.4	TCS-4	Hill
18410	18590	3.96	176.0	TCS-3	Hill
18590	18670	2.7	77.3	TCS-4	Hill
18670	18750	0	80.0	TCS-3	Hill
18825	19385	5.3	554.7	TCS-3	Hill
19385	19435	0	50.0	TCS-4	Hill
19435	19625	9.22	180.8	TCS-3	Hill
19625	19675	0	50.0	TCS-4	Hill
19675	20030	9.22	345.8	TCS-3	Hill
20030	20090	0	60.0	TCS-3A	Hill
20225	20300	3.96	71.0	TCS-3	Hill
23100	23850	7.92	742.1	TCS-3	Hill
24000	25750	28.52	1721.5	TCS-3	Hill
25850	25960	0	110.0	TCS-3	Hill
25960	26010	0	50.0	TCS-4	Hill
26010	26850	12.06	827.9	TCS-3	Hill
26850	27050	2.6	197.4	TCS-3A	Hill
27050	28370	26.22	1293.8	TCS-3	Hill
28850	29310	9.04	451.0	TCS-3	Hill
29310	29360	0	50.0	TCS-4	Hill
29360	29425	0	65.0	TCS-3	Hill
29425	29510	3.96	81.0	TCS-4	Hill
29510	30075	5.3	559.7	TCS-3	Hill
30075	30215	0	140.0	TCS-4	Hill
30215	30850	5.3	629.7	TCS-3	Hill
31050	31800	14.36	735.6	TCS-3	Hill
31800	31925	0	125.0	TCS-4	Hill
31925	31975	0	50.0	TCS-3	Hill
31975	32060	0	85.0	TCS-4	Hill
32060	32350	2.7	287.3	TCS-3	Hill
32350	32415	0	65.0	TCS-4	Hill
32415	32530	2.7	112.3	TCS-3	Hill
32530	32580	0	50.0	TCS-4	Hill
32580	32775	0	195.0	TCS-3	Hill
32775	32835	3.84	56.2	TCS-4	Hill
32835	33120	8	277.0	TCS-3	Hill
Total =			11453		



Catch water drain=

Chainage (m)		Length of CD	Net Length (m)	Side
From	To			
17270	17320	0	50.0	Hill
18275	18350	0	75.0	Hill
20300	23100	44.7	2755.3	Hill
23850	24000	2.6	147.4	Hill
25750	25850	0	100.0	Hill
28370	28850	2.6	477.4	Hill
30850	31050	2.7	197.3	Hill
Total =			3605	

Catch water drain= 3605 m

Total No of Trapezoidal Drain= 15058 m
 Chute Drain(of avg 8 m height @ 50m Interval) = 577 m



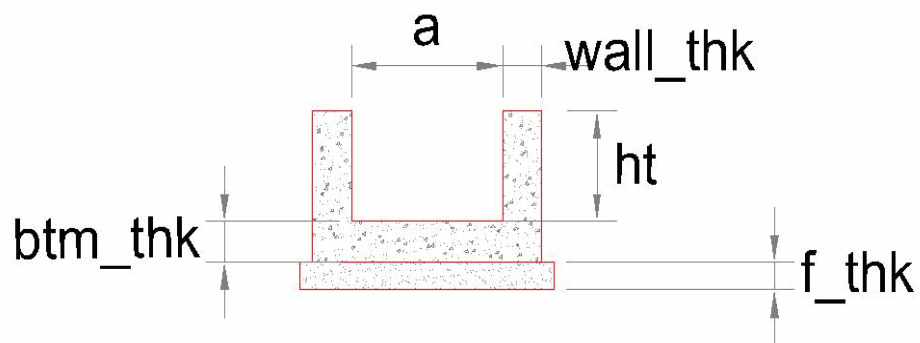
Variable Declaration

PCC Chut Drain

SI No	Variable Description	Variable	Dimension	Unit
1	Ref Drawing	a	0.600	m
2	Ref Drawing	wall_thk	0.150	m
3	Ref Drawing	btm_thk	0.150	m
4	Ref Drawing	f_thk	0.100	m
5	Ref Drawing	ht	0.400	m
6	Length	l	577.000	m



Variable Declaration



CHUT DRAIN

Trapezoidal Drain and Chut Drain

Chainage (m)		Length of CD	Net Length (m)	TCS No.	Side
From	To				
17475	17525	0	50.0	TCS-4	Hill
17525	18225	7.9	692.1	TCS-3	Hill
18225	18275	0	50.0	TCS-4	Hill
18350	18410	2.6	57.4	TCS-4	Hill
18410	18590	3.96	176.0	TCS-3	Hill
18590	18670	2.7	77.3	TCS-4	Hill
18670	18750	0	80.0	TCS-3	Hill
18825	19385	5.3	554.7	TCS-3	Hill
19385	19435	0	50.0	TCS-4	Hill
19435	19625	9.22	180.8	TCS-3	Hill
19625	19675	0	50.0	TCS-4	Hill
19675	20030	9.22	345.8	TCS-3	Hill
20030	20090	0	60.0	TCS-3A	Hill
20225	20300	3.96	71.0	TCS-3	Hill
23100	23850	7.92	742.1	TCS-3	Hill
24000	25750	28.52	1721.5	TCS-3	Hill
25850	25960	0	110.0	TCS-3	Hill
25960	26010	0	50.0	TCS-4	Hill
26010	26850	12.06	827.9	TCS-3	Hill
26850	27050	2.6	197.4	TCS-3A	Hill
27050	28370	26.22	1293.8	TCS-3	Hill
28850	29310	9.04	451.0	TCS-3	Hill
29310	29360	0	50.0	TCS-4	Hill
29360	29425	0	65.0	TCS-3	Hill
29425	29510	3.96	81.0	TCS-4	Hill
29510	30075	5.3	559.7	TCS-3	Hill
30075	30215	0	140.0	TCS-4	Hill
30215	30850	5.3	629.7	TCS-3	Hill
31050	31800	14.36	735.6	TCS-3	Hill
31800	31925	0	125.0	TCS-4	Hill
31925	31975	0	50.0	TCS-3	Hill
31975	32060	0	85.0	TCS-4	Hill
32060	32350	2.7	287.3	TCS-3	Hill
32350	32415	0	65.0	TCS-4	Hill
32415	32530	2.7	112.3	TCS-3	Hill
32530	32580	0	50.0	TCS-4	Hill
32580	32775	0	195.0	TCS-3	Hill
32775	32835	3.84	56.2	TCS-4	Hill
32835	33120	8	277.0	TCS-3	Hill
Total =			11453		



Catch water drain=

Chainage (m)		Length of CD	Net Length (m)	Side
From	To			
17270	17320	0	50.0	Hill
18275	18350	0	75.0	Hill
20300	23100	44.7	2755.3	Hill
23850	24000	2.6	147.4	Hill
25750	25850	0	100.0	Hill
28370	28850	2.6	477.4	Hill
30850	31050	2.7	197.3	Hill
Total =			3605	

Catch water drain= 3605 m

Total No of Trapezoidal Drain= 15058 m
 Chute Drain(of avg 8 m height @ 50m Interval) = 577 m



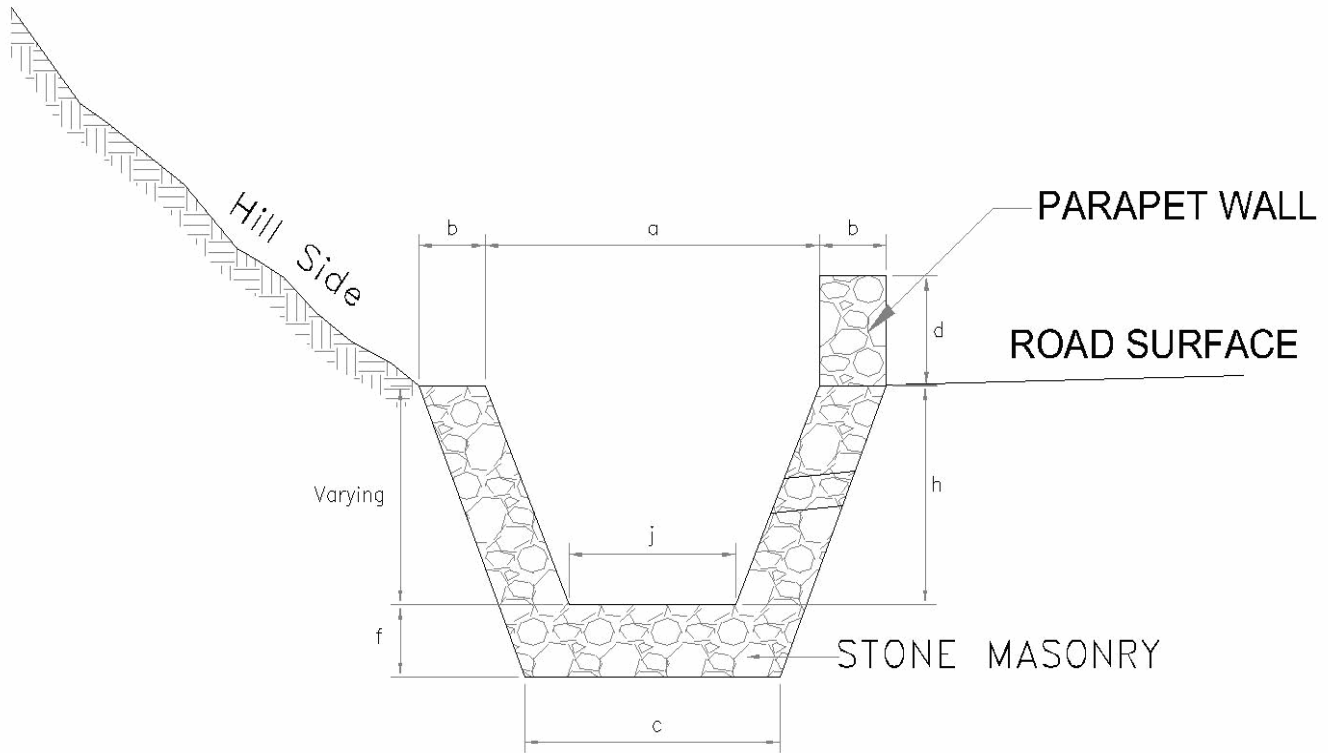
Variable Declaration

RR Masonry Trapezoidal Drain

SI No	Variable Description	Variable	Dimension	Unit
1	Ref Drawing	a	1.000	m
2	Ref Drawing	b	0.200	m
3	Ref Drawing	d	0.300	m
4	Ref Drawing	h	0.850	m
5	Ref Drawing	c	0.765	m
6	Ref Drawing	j	0.500	m
7	Ref Drawing	f	0.200	m
8	Length	l	15058.000	m



Variable Declaration



SECTION OF STONE MASONRY
TRAPEZOIDAL DRAIN

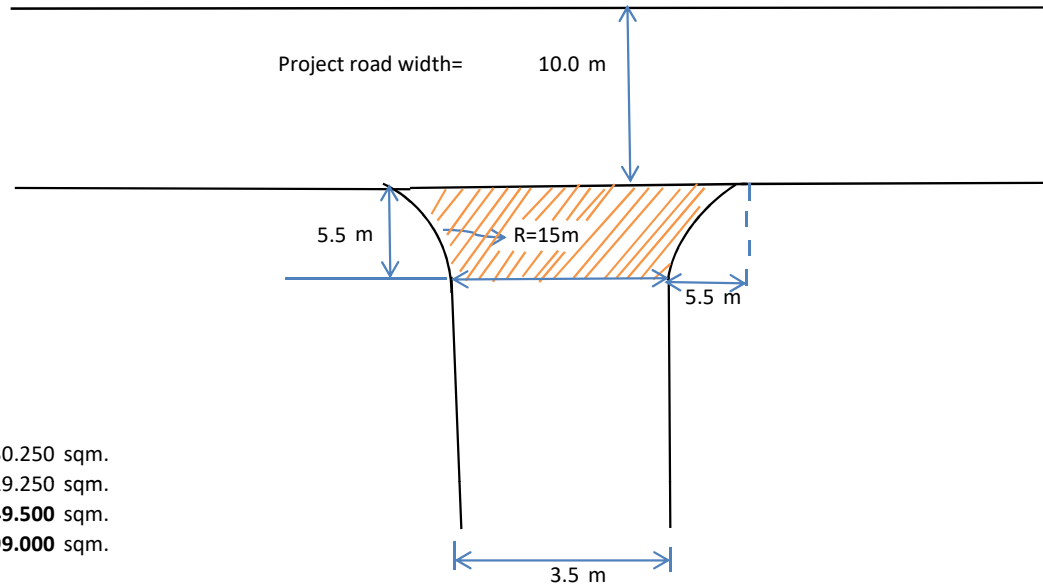
Minor Junction

Sl No	Ch(Existing Ch)	Type Of Junction
1	16+110	T
2	16+290	T
3	16+435	T
4	17+010	T
5	17+710	T
6	17+910	T
7	17+990	Y
8	18+545	T
9	19+590	Y
10	19+765	Y
11	20+120	Y
12	20+260	Y
13	23+900	Y
14	23+950	Y
15	25+750	T
16	26+710	Y
17	28+450	Y



Minor Junction

Pavement Layer	Thickness (m)
GSB =	0.200
WMM-II =	0.125
WMM-I =	0.125
DBM =	0.080
BC =	0.040



For triangular portion area = 30.250 sqm.
 For rectangular portion area = 19.250 sqm.
 Total area of 3 legged Junction = **49.500** sqm.
 Total area of 4 legged Junction = **99.000** sqm.

Quantity Calculation for Minor Junction

Type	No	Each Avg. area	Total Area (sqm)
3 legged	17	49.50	842
		Total =	842



Variable Declaration

Minor Junction

SI No	Variable Description	Variable	Dimension	Unit
1	Total_area	tot_area	842.000	area
2	BC	bc	0.040	m
3	DBM	dbm	0.080	m
4	WMM1	wmm1	0.125	m
5	WMM2	wmm2	0.125	m
6	GSB Thickness	gsb	0.200	m
7	GSB Reuse	gsb_per	36.200	



Retaining Wall

Chainage (m)		Length of CD	Net Length (m)	TCS No.	Side	Avg. Height (m)
From	To					
17200	17270	3.96	66.0	TCS-8	Valley	2
17475	17525	0	50.0	TCS-4	Valley	2
18225	18275	0	50.0	TCS-4	Valley	2
18350	18410	2.6	57.4	TCS-4	Valley	2
18590	18670	2.7	77.3	TCS-4	Valley	2
19385	19435	0	50.0	TCS-4	Valley	2
19625	19675	0	50.0	TCS-4	Valley	2
25960	26010	0	50.0	TCS-4	Valley	2
29310	29360	0	50.0	TCS-4	Valley	2
29425	29510	3.96	81.0	TCS-4	Valley	2
30075	30215	0	140.0	TCS-4	Valley	2
31800	31925	0	125.0	TCS-4	Valley	2
31975	32060	0	85.0	TCS-4	Valley	2
32350	32415	0	65.0	TCS-4	Valley	2
32530	32580	0	50.0	TCS-4	Valley	2
32775	32835	3.84	56.2	TCS-4	Valley	2
Total =			1103			

Length of 2.0 m Retaining Wall = **1103 m**

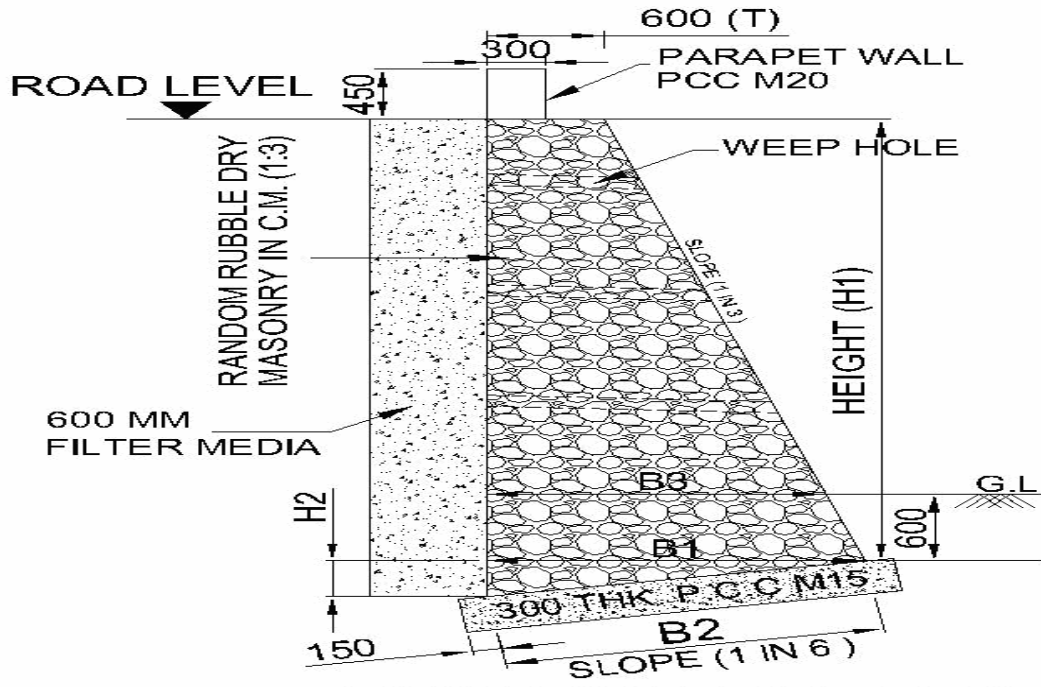



Variable Declaration

Retaining Wall 2.0m

SI No	Variable Description	Variable	Dimension	Unit
1	Top Width (T)	T	0.600	m
2	Height	H1	2.000	m
3	Slope at Base(1 In 6)	Z	9.462	degree
4	$B1 = (T+H1/3)$	B1	1.270	m
5	$B2 = B1/\text{Cos}Z$	B2	1.284	m
6	$H2 = B1.\text{Tan}Z$	H2	0.211	m
7	EGL to PCC top Height	d	0.600	m
8	Slope of Wall(1 in 3)	Y	18.435	degree
9	$B3 = T + (H1-d)\text{Tan}Y$	e	1.067	m
10	Thickness PCC	pcc_thk	0.300	m
11	Offset at PCC	o	0.150	m
12	Filter Media Width	mw	0.600	m
13	length	l	1103.000	m
14	No of weephole along slope of 1m gap $m = ((H1 - d) / \text{COS}Y) / 1$	n	2.000	nos
15	Avg Length of Weephole $q = (B3 + T) / 2$	weep_len	0.834	m
16	percentage of rock cutting	p_c	0.200	
17	Taking gap every 10m length	gap	0.300	m
18	Width of parapet wall	para_w	0.300	m
19	height of parapet wall	para_ht	0.450	m

Variable Declaration



TYPICAL CROSS SECTION OF
RETAINING WALL (1.5M TO 4.0M HIGHT)
(SCALE 1:50)

Breast Wall

Chainage (m)		Length of CD	Net Length (m)	TCS No.	Side
From	To				
17270	17320	0	50.0	TCS-5	Hill
18275	18350	0	75.0	TCS-5	Hill
20300	23100	44.7	2755.3	TCS-5	Hill
23850	24000	2.6	147.4	TCS-7	Hill
25750	25850	0	100.0	TCS-7	Hill
28370	28850	2.6	477.4	TCS-7	
30850	31050	2.7	197.3	TCS-7	Hill
Total =			3802		

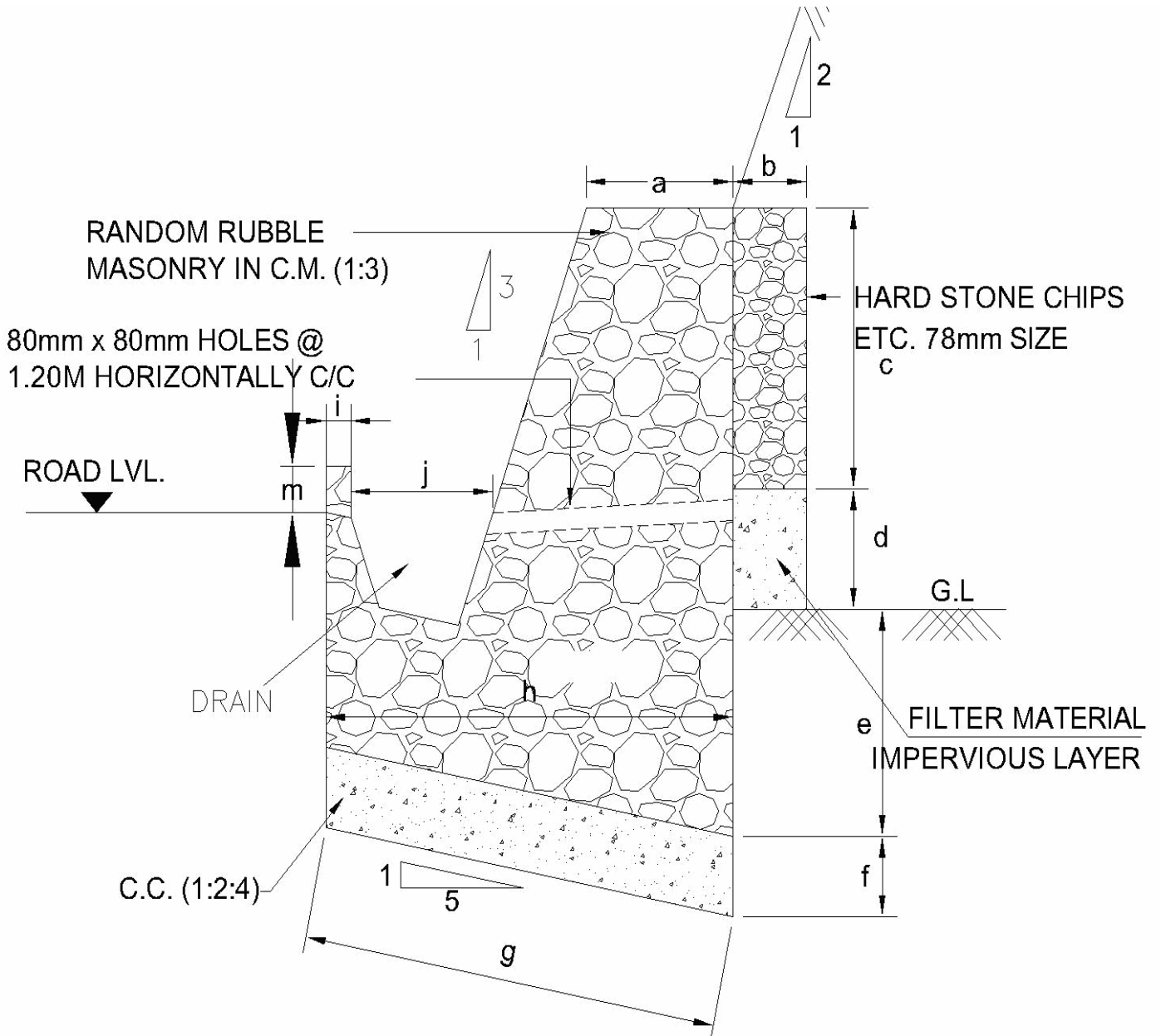



Variable Declaration

Breast Wall 2.0m Ht

SI No	Variable Description	Variable	Dimension	Unit
1	From Diagram	a	0.600	m
2	From Diagram	b	0.300	m
3	From Diagram	c	1.550	m
4	From Diagram	d	0.450	m
5	From Diagram	e	0.850	m
6	From Diagram	f	0.300	m
7	PCC Width $g = \sqrt{h^2 + (h/5)^5}$	g	1.933	m
8	From Diagram	h	1.890	m
9	From Diagram	i	0.100	m
10	From Diagram	j	0.600	m
11	length	l	3802.000	m
12	Percentage of Earthwork in Ordinary Rock(20%)	p	0.200	
13	From Diagram	m	0.000	m

Variable Declaration



TYPE-1:-TYPICAL CROSS SECTION OF BREAST WALL

Passenger Shelter

Chainage	Side	Name of Place
16+945	Both Side	Keithelmanbi Market
25+755	Both Side	S. Lajang Village
28+075	Both Side	Kotlen Village

No Of Busbay & Passenger Shelte = 6 nos(In 3 IOcation)



Variable Declaration

Passenger Shelter

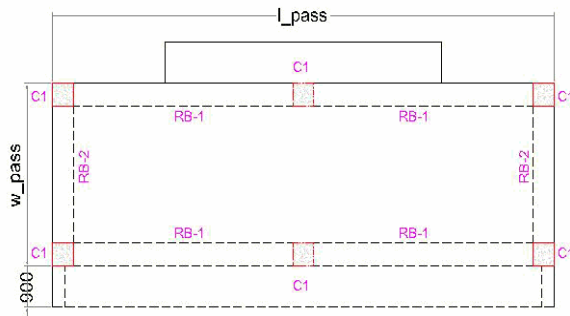
SI No	Variable Description	Variable	Dimension	Unit
1	No of Passenger Shelter	n	6.000	nos
2	Foundation Length for column	a	0.750	m
3	Foundation Width for column	b	0.750	m
4	Foundation Depth for column	df	0.750	m
5	Nos of column	col_n	6.000	Nos
6	Foundation length for Brick work	l	13.500	m
7	Foundation width for Brick work	w	0.500	m
8	Foundation depth for Brick work	db	0.300	m
9	Each column length	col_l	0.250	m
10	Each column width	col_w	0.250	m
11	Thickness of foundation at bottom	btm_thk	0.100	m
12	Thickness of foundation at top	top_thk	0.100	m
13	Foundation reinforcement	rf	120.000	kg/cum
14	Width of brick wall	w_wall	0.125	m
15	Thickness of pcc	pcc_thk	0.100	m
16	Length of Passenger shelter	l_pass	6.000	m
17	Width of Passenger shelter	w_pass	2.000	m
18	Foundation brick wall top thickness	wtop_thk	0.150	m
19	Foundation brick wall btm thickness	wbtm_thk	0.150	m
20	Side wall & back wall lower portion height	wall_h	0.550	m
21	Side wall upper portion length	sw_l	1.500	m
22	Side wall upper portion height	sw_h	2.130	m
23	Back wall upper portion Length	bw_l	2.650	m
24	Back wall upper portion height	bw_h	0.950	m
25	Seating bench length	bch_l	5.000	m
26	Seating bench width	bch_w	0.500	m
27	Seating bench thickness	bch_thk	0.075	m
28	Nos of window	win_n	2.000	nos
29	Length of window	win_l	1.250	m
30	Height of window	win_h	0.900	m
31	Front column height	fcol_h	2.650	m
32	Back column height	bcol_h	2.100	m
33	Side beam length (RB2)	sb_l	1.530	m
34	Side beam width	sb_w	0.250	m
35	Side beam thickness	sb_thk	0.350	m
36	Side beam length (RB1)	sb_a	3.000	m
37	Thickness of Roof slab	roof_thk		m

Variable Declaration

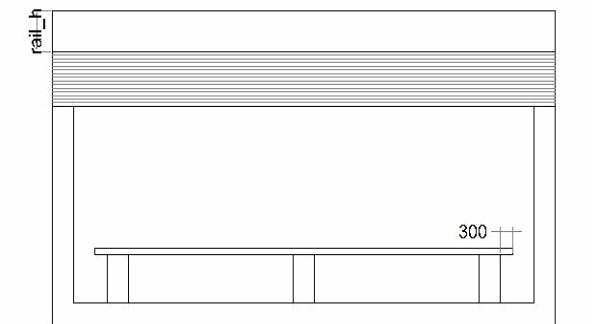
38	Width of front Chajja	fchj_w	0.680	m
39	Width of back Chajja	bchj_w	0.450	m
40	Length of railing	rail_l	9.500	m
41	Height of railing	rail_h	0.450	m
42	Width of roof slab	roof_w	1.530	m
43	Superstructure reinforcement	srf	100.000	kg/cum
44	Side wall inner side length	sw_in	1.875	m
45	Back wall inner side length	bw_in	5.800	m
46	Side wall height (plastering &painting)	sw_ht	3.830	m
47	Back wall height (plastering &painting)	bw_ht	2.350	m
48	top width of wall in foundation	fw_wall	0.250	m



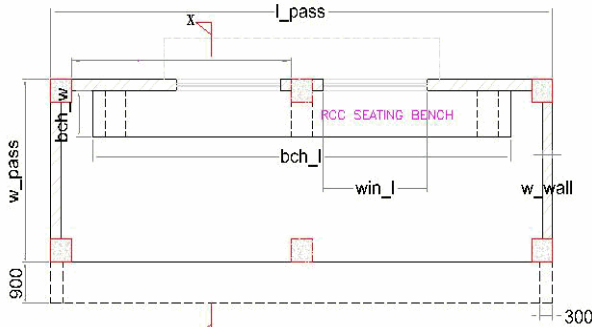

Variable Declaration



STRUCTURAL ARRANGEMENT PLAN

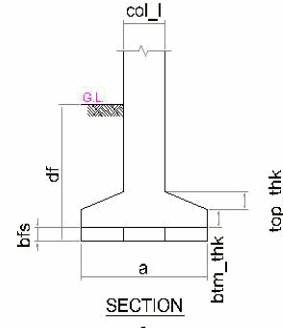


FRONT ELEVATION

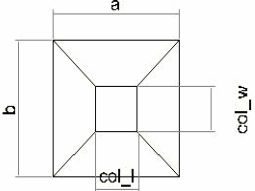


PLAN

PASSENGER SHELTER

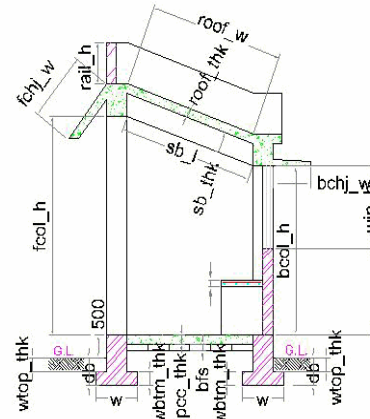


SECTION



PLAN

COLUMN FOUNDATION DETAILS



SECTION X-X

Busbay locations

Chainage	Side	Name of Place
16+945	Both Side	Keithelmanbi Market
25+755	Both Side	S. Lajang Village
28+075	Both Side	Kotlen Village

No Of Busbay & Passenger Shelte = 6 nos(In 3 lOcation)

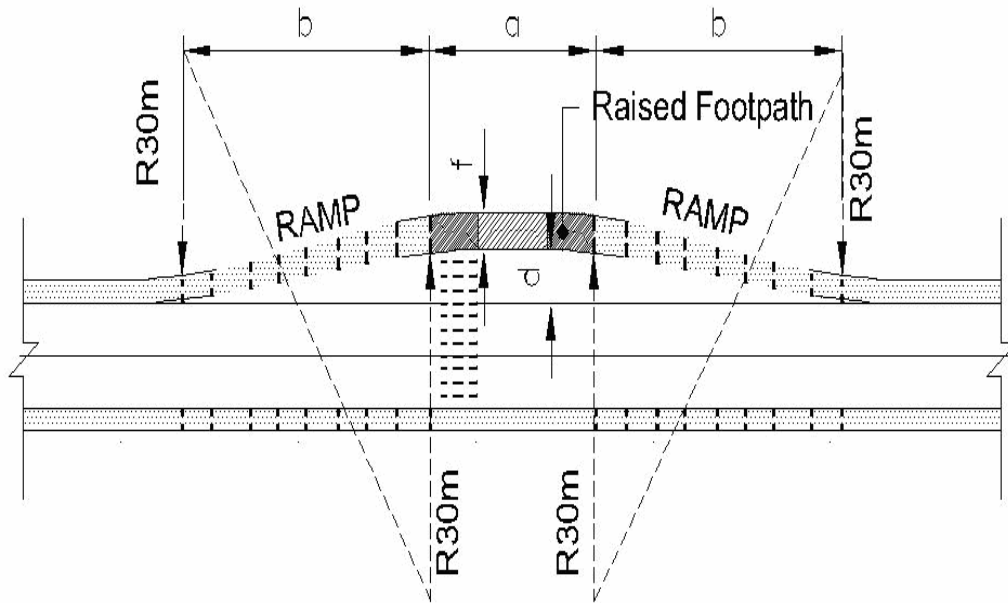


Variable Declaration

Busbay (2 Lane)

SI No	Variable Description	Variable	Dimension	Unit
1	BC Thickness	bc	0.040	m
2	DBM Thickness	dbm	0.080	m
3	WMM-I Thickness	wmm1	0.125	m
4	WMM-II Thickness	wmm2	0.125	m
5	GSB Thickness	gsb	0.200	m
6	SG Thickness	sg	0.500	m
7	Nos of Bus Bay	n	6.000	nos
8	Width Footpath	f	2.500	m
9	Ref Drawing	a	15.000	m
10	Ref Drawing	b	22.000	m
11	Ref Drawing	d	3.500	m
12	GSB percentage Re-use	gsb_per	36.200	percentage

Variable Declaration



TYPICAL LAYOUT OF PICK-UP BUS STOP ON HILLY AREA

Traffic Signs and Other Appurtenance

Summary Of Traffic Signs

Total No of Street Light=	53	Nos	Bill No- 06, Sl. No- 10
Kilometer stones=	14	Nos	Bill No- 06, Sl. No- 2
5th Kilometer stones=	3	Nos	Bill No- 06, Sl. No- 1
Boundary Stones=	174	Nos	Bill No- 06, Sl. No- 3
Delineators (100 cm long and circular shaped)+Hazard marker =	2005	Nos	Bill No- 06, Sl. No- 8
Road Stud=	9726	Nos	Bill No- 06, Sl. No- 9
900 mm Octagonal	17	Nos	Bill No- 06, Sl. No- 8
600 mm circular	66	Nos	Bill No- 06, Sl. No- 5
900 mm Tringular	274	Nos	Bill No- 06, Sl. No- 5
800 mm x 600 mm rectangular	6	Nos	Bill No- 06, Sl. No- 6
Convex Mirror for Blind Curve	36	Nos	Bill No- 06, Sl. No- 16
Rumble Strip=	580	sqm	Bill No- 06, Sl. No- 13




Traffic sign Calculation

Sl No	Type	IRC-67 2012 Specification	Dimension	Chainage / Location	No	Remarks
1	Right Hand Side Curve	fig 15.02	900 mm Tringular		56	@ 2per location
2	Left Hand Side Curve	fig 15.01	900 mm Tringular		56	@ 2per location
3	Zig-Zag Curve	fig 15.07	900 mm Tringular		19	@ 1per location
4	Reverse Curve	fig 15.06 & 15.05	900 mm Tringular		0	@ 1per location
5	Built-up area	fig 15.35	900 mm Tringular		12	@ 2per location
6	Side road	fig 15.09 & 15.10	900 mm Tringular		34	@ 2per location
7	Pedestain Crossing		900 mm Tringular	side road, bus bay	40	@ 2per location
8	Bus Stop	fig 17.35	800x600 rectangular		6	@ 2per location
9	Direction Sign		<.0.9 sqm	Side road & cross road	0	@ 2per location
10	Direction Sign		>0.9 sqm	bridge	0	@ 2per location
11	Hazard Marker	fig 15.76 & fig 15.77	900x300 mm rectangular	Culvert, Bridge Location	292	@ 4 per structure
12	Stop Sign	fig 14.01	900 mm Octagonal	Side road & cross road	17	@ 1 per location
13	Speed limit	fig 14.37	600mm Cicular		66	@ 2per location
14	Rumble strip	fig 15.50	900 Tringular		29	@ 2per location in Built Up Area & @ 1per location in Side Road
15	Hair pin Bend	fig 15.03 & 15.04	900 mm Tringular		28	@ 2per location
16	Convex Mirror for Blind Curve				36	@ 1per location




Traffic sign Calculation

SUMMARY		
90 cm equilateral triangle		274 nos
Stop Sign (90 cm high octagon)		17 nos
60 cm circular		66 nos
80 cm x 60 cm rectangular		6 nos
Direction Sign	<.0.9 sqm	0 nos
Direction Sign	>0.9 sqm	0 nos
Hazard Marker		292 nos
Convex Mirror for Blind Curve		36 nos
Rumble Strip		29 nos

Calculation of km Stone, Hectometer Stone and Boundary Stone

Item	Remarks	Nos
Kilometer stones	Total KM Stone No. of 5th KM stone	14
5th Kilometer stones	(km stone 5th, 10th , 15th, 20th etc)	3
Boundary stones	(Total Lengthx5x2) + 2x1	174




Quantity Calculation for Road Stud

SL. No.	Description of section	START	END	Transition length	START CH.	END CH.	Length	Radius	Spacing on Curve (S)	Total On median (nos)	Total On shoulder
		CHAINAGE	CHAINAGE		Road Stud	Road stud					
1	Horizontal curve :: Curve radii upto 450 , spacing =6m. Curve radii 451 to 750 , spacing =9m. Curve radii 751 to 2000m & critical sections, spacing =18m	16293.058	16421.769	35	16238.058	16476.769	238.71	700	9	27	54
		16701.11	16716.868	90	16591.110	16826.868	235.76	250	6	40	80
		16879.294	16884.222	35	16824.294	16939.222	114.93	60	6	20	40
		16991.377	17008.707	20	16951.377	17048.707	97.33	20	6	17	34
		17070.814	17117.35	40	17010.814	17177.350	166.54	50	6	28	56
		17205.311	17241.714	30	17155.311	17291.714	136.40	35	6	23	46
		17357.32	17397.722	20	17317.320	17437.722	120.40	20	6	21	42
		17459.633	17474.343	30	17409.633	17524.343	114.71	70	6	20	40
		17588.509	17599.357	35	17533.509	17654.357	120.85	60	6	21	42
		17675.616	17783.728	25	17630.616	17828.728	198.11	45	6	34	68
		17901.65	17919.296	30	17851.650	17969.296	117.65	30	6	20	40
		18037.183	18047.302	30	17987.183	18097.302	110.12	30	6	19	38
		18198.096	18204.047	25	18153.096	18249.047	95.95	180	6	16	32
		18320.68	18341.102	35	18265.680	18396.102	130.42	125	6	22	44
		18416.44	18454.847	25	18371.440	18499.847	128.41	40	6	22	44
		18514.794	18520.17	25	18469.794	18565.170	95.38	80	6	16	32
		18587.113	18591.291	25	18542.113	18636.291	94.18	90	6	16	32
		18744.395	18758.384	20	18704.395	18798.384	93.99	20	6	16	32
		18809.765	18896.786	15	18774.765	18931.786	157.02	80	6	27	54
		18937.046	18946.141	25	18892.046	18991.141	99.10	40	6	17	34
		18993.595	19033.39	20	18953.595	19073.390	119.79	20	6	20	40
		19120.021	19171.313	35	19065.021	19226.313	161.29	60	6	27	54
		19265.274	19316.512	30	19215.274	19366.512	151.24	70	6	26	52
		19371.607	19400.033	15	19336.607	19435.033	98.43	60	6	17	34
		19444.949	19491.667	15	19409.949	19526.667	116.72	60	6	20	40
		19527.393	19550.507	15	19492.393	19585.507	93.11	70	6	16	32
19595.497	19635.196	20	19555.497	19675.196	119.70	20	6	20	40		
19687.62	19727.591	30	19637.620	19777.591	139.97	30	6	24	48		
19838.889	19881.346	25	19793.889	19926.346	132.46	40	6	23	46		
19981.747	19997.132	20	19941.747	20037.132	95.39	50	6	16	32		
20109.917	20114.024	25	20064.917	20159.024	94.11	45	6	16	32		
20154.919	20201.412	15	20119.919	20236.412	116.49	35	6	20	40		



SL. No.	Description of section	START	END	Transition length	START CH.	END CH.	Length	Radius	Spacing on Curve (S)	Total On median (nos)	Total On shoulder
		CHAINAGE	CHAINAGE		Road Stud	Road stud					
		20237.479	20253.319	15	20202.479	20288.319	85.84	30	6	15	30
		20287.431	20474.045	15	20252.431	20509.045	256.61	80	6	43	86
		20599.101	20635.815	25	20554.101	20680.815	126.71	40	6	22	44
		20834.46	20868.451	20	20794.460	20908.451	113.99	20	6	19	38
		20941.295	20983.172	20	20901.295	21023.172	121.88	50	6	21	42
	Horizontal curve ::	21026.595	21077.13	20	20986.595	21117.130	130.54	200	6	22	44
		21137.937	21168.009	25	21092.937	21213.009	120.07	80	6	21	42
	Curve radii upto 450 , spacing =6m.	21253	21263.871	15	21218.000	21298.871	80.87	30	6	14	28
		21295.179	21334.238	15	21260.179	21369.238	109.06	30	6	19	38
		21506.388	21545.145	15	21471.388	21580.145	108.76	30	6	19	38
	Curve radii 451 to 750 , spacing =9m.	21610.682	21627.985	20	21570.682	21667.985	97.30	25	6	17	34
		21672.72	21694.68	15	21637.720	21729.680	91.96	30	6	16	32
		21777.789	21818.726	20	21737.789	21858.726	120.94	20	6	21	42
		21948.61	21966.074	20	21908.610	22006.074	97.46	20	6	17	34
	Curve radii 751 to 2000m & critical sections, spacing =18m	22043.733	22047.957	15	22008.733	22082.957	74.22	60	6	13	26
		22093.99	22131.178	20	22053.990	22171.178	117.19	50	6	20	40
		22201.462	22210.664	30	22151.462	22260.664	109.20	30	6	19	38
		22270.712	22305.453	30	22220.712	22355.453	134.74	30	6	23	46
		22405.36	22458.318	25	22360.360	22503.318	142.96	45	6	24	48
		22506.509	22518.409	20	22466.509	22558.409	91.90	50	6	16	32
		22558.599	22641.383	20	22518.599	22681.383	162.78	50	6	28	56
		22679.055	22757.421	15	22644.055	22792.421	148.37	125	6	25	50
		22880.505	22895.113	25	22835.505	22940.113	104.61	40	6	18	36
		22953.228	23003.228	25	22908.228	23048.228	140.00	300	6	24	48
		23048.987	23156.604	25	23003.987	23201.604	197.62	300	6	33	66
		23188.274	23218.531	20	23148.274	23258.531	110.26	20	6	19	38
		23257.156	23343.744	15	23222.156	23378.744	156.59	65	6	27	54
		23389.792	23415.696	20	23349.792	23455.696	105.90	20	6	18	36
		23461.795	23572.544	35	23406.795	23627.544	220.75	180	6	37	74
		23606.009	23701.625	15	23571.009	23736.625	165.62	70	6	28	56
		23743.68	23748.059	15	23708.680	23783.059	74.38	80	6	13	26
		23817.566	23841.288	25	23772.566	23886.288	113.72	80	6	19	38
		23890.56	23903.545	20	23850.560	23943.545	92.98	100	6	16	32
		24144.144	24203.92	30	24094.144	24253.920	159.78	70	6	27	54
		24329.981	24344.039	20	24289.981	24384.039	94.06	50	6	16	32
		24468.814	24483.275	35	24413.814	24538.275	124.46	60	6	21	42



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SL. No.	Description of section	START	END	Transition length	START CH.	END CH.	Length	Radius	Spacing on Curve (S)	Total On median (nos)	Total On shoulder	
		CHAINAGE	CHAINAGE		Road Stud	Road stud						
	Horizontal curve ::	24550.101	24557.2	30	24500.101	24607.200	107.10	70	6	18	36	
		24624.048	24700.084	20	24584.048	24740.084	156.04	100	6	27	54	
	Curve radii upto 450 , spacing =6m.	24749.284	24770.083	15	24714.284	24805.083	90.80	180	6	16	32	
		24889.519	24932.979	30	24839.519	24982.979	143.46	70	6	24	48	
		25053	25059.216	25	25008.000	25104.216	96.22	40	6	17	34	
		25085.663	25243.193	35	25030.663	25298.193	267.53	300	6	45	90	
	Curve radii 451 to 750 , spacing =9m.	25263.99	25286.77	20	25223.990	25326.770	102.78	50	6	18	36	
		25340.999	25374.431	20	25300.999	25414.431	113.43	20	6	19	38	
		25491.637	25524.686	25	25446.637	25569.686	123.05	40	6	21	42	
	Curve radii 751 to 2000m & critical sections, spacing =18m	25670.619	25692.551	20	25630.619	25732.551	101.93	50	6	17	34	
		25820.808	25834.094	30	25770.808	25884.094	113.29	70	6	19	38	
		25898.339	25909.968	25	25853.339	25954.968	101.63	80	6	17	34	
		26012.187	26034.413	20	25972.187	26074.413	102.23	20	6	18	36	
		26074.633	26084.142	20	26034.633	26124.142	89.51	20	6	15	30	
		26132.748	26166.078	25	26087.748	26211.078	123.33	40	6	21	42	
		26229.776	26237.187	15	26194.776	26272.187	77.41	60	6	13	26	
		26275.959	26292.623	20	26235.959	26332.623	96.66	50	6	17	34	
		26387.583	26452.322	35	26332.583	26507.322	174.74	60	6	30	60	
		26498.513	26526.759	25	26453.513	26571.759	118.25	80	6	20	40	
		26547.15	26582.067	20	26507.150	26622.067	114.92	25	6	20	40	
		26652.33	26671.545	20	26612.330	26711.545	99.21	20	6	17	34	
		26692.331	26746.084	25	26647.331	26791.084	143.75	80	6	24	48	
		Horizontal curve ::	26784.641	26788.305	25	26739.641	26833.305	93.66	40	6	16	32
			26840.07	26852.536	25	26795.070	26897.536	102.47	40	6	18	36
	26888.971		26947.036	25	26843.971	26992.036	148.06	180	6	25	50	
	26996.065		27028.927	25	26951.065	27073.927	122.86	40	6	21	42	
	27088.864		27154.05	25	27043.864	27199.050	155.19	40	6	26	52	
	27201.5		27215.284	20	27161.500	27255.284	93.78	20	6	16	32	
	27277.443		27287.199	20	27237.443	27327.199	89.76	50	6	15	30	
	27420.063		27445.107	20	27380.063	27485.107	105.04	50	6	18	36	
27498.198	27536.191		30	27448.198	27586.191	137.99	30	6	23	46		
27586.31	27630.784		20	27546.310	27670.784	124.47	50	6	21	42		
27676.366	27704.131		25	27631.366	27749.131	117.76	40	6	20	40		
27798.609	27837.262		25	27753.609	27882.262	128.65	40	6	22	44		
27972.516	28042.194		25	27927.516	28087.194	159.68	500	9	18	36		
28159.629	28167.513		15	28124.629	28202.513	77.88	30	6	13	26		



SL. No.	Description of section	START	END	Transition length	START CH.	END CH.	Length	Radius	Spacing on Curve (S)	Total On median (nos)	Total On shoulder
		CHAINAGE	CHAINAGE		Road Stud	Road stud					
	Curve radii 451 to 750 , spacing =9m.	28199.431	28228.648	15	28164.431	28263.648	99.22	30	6	17	34
		28288.539	28417.225	25	28243.539	28462.225	218.69	100	6	37	74
		28442.78	28454.524	20	28402.780	28494.524	91.74	20	6	16	32
	Curve radii 751 to 2000m & critical sections, spacing =18m	28509.734	28539.389	15	28474.734	28574.389	99.65	60	6	17	34
		28576.639	28586.342	15	28541.639	28621.342	79.70	60	6	14	28
		28657.914	28658.414	30	28607.914	28708.414	100.50	70	6	17	34
		28725.308	28748.431	15	28690.308	28783.431	93.12	125	6	16	32
		28820.468	28826.869	20	28780.468	28866.869	86.40	50	6	15	30
		28879.246	28896.64	30	28829.246	28946.640	117.39	30	6	20	40
		28994.186	29096.806	15	28959.186	29131.806	172.62	125	6	29	58
		29163.09	29182.215	25	29118.090	29227.215	109.13	80	6	19	38
		29279.569	29283.244	40	29219.569	29343.244	123.67	50	6	21	42
		29401.382	29455.002	15	29366.382	29490.002	123.62	150	6	21	42
		29493.059	29512.99	20	29453.059	29552.990	99.93	50	6	17	34
	29581.063	29588.777	20	29541.063	29628.777	87.71	100	6	15	30	
	29648.863	29657.781	25	29603.863	29702.781	98.92	80	6	17	34	
	29722.382	29800.407	25	29677.382	29845.407	168.02	500	9	19	38	
	Horizontal curve ::	29839.618	29847.003	35	29784.618	29902.003	117.39	135	6	20	40
		29903.868	29943.352	25	29858.868	29988.352	129.48	500	9	15	30
		30023.325	30074.928	15	29988.325	30109.928	121.60	100	6	21	42
		30117.597	30129.708	25	30072.597	30174.708	102.11	40	6	18	36
		30216.475	30234.055	15	30181.475	30269.055	87.58	150	6	15	30
		30264.532	30283.779	15	30229.532	30318.779	89.25	60	6	15	30
		30300.279	30332.729	25	30255.279	30377.729	122.45	180	6	21	42
		30444.415	30456.684	15	30409.415	30491.684	82.27	100	6	14	28
		30499.635	30532.837	20	30459.635	30572.837	113.20	20	6	19	38
		30783.028	30844.443	25	30738.028	30889.443	151.42	90	6	26	52
		30915.611	30939.402	40	30855.611	30999.402	143.79	55	6	24	48
	Curve radii upto 450 , spacing =6m.	31097.358	31131.169	20	31057.358	31171.169	113.81	25	6	19	38
		31206.632	31229.984	20	31166.632	31269.984	103.35	50	6	18	36
		31271.321	31305.165	20	31231.321	31345.165	113.84	50	6	19	38
	Curve radii 451 to 750 , spacing =9m.	31363.842	31408.4	30	31313.842	31458.400	144.56	70	6	25	50
		31557.593	31569.654	20	31517.593	31609.654	92.06	100	6	16	32
		31640.359	31673.704	20	31600.359	31713.704	113.35	25	6	19	38
Curve radii 751 to 2000m & critical sections, spacing =18m	31730.928	31748.307	25	31685.928	31793.307	107.38	80	6	18	36	
	31800.042	31813.21	15	31765.042	31848.210	83.17	150	6	14	28	



SL. No.	Description of section	START	END	Transition length	START CH.	END CH.	Length	Radius	Spacing on Curve (S)	Total On median (nos)	Total On shoulder
		CHAINAGE	CHAINAGE		Road Stud	Road stud					
	2000m & critical sections, spacing =18m	31844.836	31866.318	15	31809.836	31901.318	91.48	125	6	16	32
		31961.905	31970.463	35	31906.905	32025.463	118.56	60	6	20	40
		32020.99	32030.412	15	31985.990	32065.412	79.42	80	6	14	28
		32081.379	32102.102	25	32036.379	32147.102	110.72	80	6	19	38
		32188.305	32216.885	35	32133.305	32271.885	138.58	60	6	24	48
		32253.591	32307.397	25	32208.591	32352.397	143.81	300	6	24	48
		32363.114	32379.989	15	32328.114	32414.989	86.88	125	6	15	30
		32436.865	32445.33	25	32391.865	32490.330	98.47	80	6	17	34
		32555.143	32561.545	40	32495.143	32621.545	126.40	50	6	22	44
		32636.636	32697.773	35	32581.636	32752.773	171.14	60	6	29	58
		32791.815	32811.65	40	32731.815	32871.650	139.83	50	6	24	48
		32872.761	32883.831	15	32837.761	32918.831	81.07	60	6	14	28
			Horizontal curve :: Curve radii upto 450 ,	32919.476	32940.356	20	32879.476	32980.356	100.88	50	6	17	34
32988.357	32996.234			20	32948.357	33036.234	87.88	50	6	15	30
33053.854	33088.177			20	33013.854	33128.177	114.32	20	6	20	40
2	Major Bridge	Structure				500.00		9	56	112	
2	Builtup sections					550		18	31	62	
									3242	6484	

Total no. of Road stud = 9726 no.



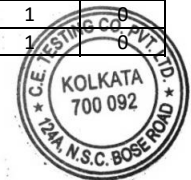
CALCULATION FOR DELINEATOR

In horizontal Curves (radius > 1000m)

HIP / CURVE NO.	ELEMENT	START CHAINAGE	END CHAINAGE	RADIUS (M)	Spacing on Curve (S)	HAND OF ARC	Length	Nos in outside curve (s)	Nos in inner curve (2s)	1.8s beginning of curve	1.8s end of curve	3s beginning of curve	3s end of curve	6s beginning of curve	6s end of curve
					as per IRC:79- 1981										
2	Arc	16293.058	16421.769	700	42	Right	128.711	4	2	1	1	1	0	1	0
3	Arc	16701.11	16716.868	250	20	Left	15.758	1	1	1	1	1	0	1	0
4	Arc	16879.294	16884.222	60	8	Left	4.928	1	1	1	1	1	1	1	0
5	Arc	16991.377	17008.707	20	6	Left	17.330	3	2	1	1	1	1	1	0
6	Arc	17070.814	17117.35	50	8	Right	46.536	6	3	1	1	1	1	1	0
8	Arc	17205.311	17241.714	35	6	Left	36.403	7	4	1	1	1	1	1	0
9	Arc	17357.32	17397.722	20	6	Right	40.402	7	4	1	1	1	1	1	0
10	Arc	17459.633	17474.343	70	8	Right	14.710	2	1	1	1	1	1	1	0
11	Arc	17588.509	17599.357	60	8	Left	10.848	2	1	1	1	1	0	1	0
13	Arc	17675.616	17783.728	45	6	Right	108.112	19	10	1	1	1	1	1	0
15	Arc	17901.65	17919.296	30	6	Left	17.646	3	2	1	1	1	1	1	0
16	Arc	18037.183	18047.302	30	6	Left	10.119	2	1	1	1	1	1	1	1
18	Arc	18198.096	18204.047	180	12	Right	5.951	1	1	1	1	1	1	1	0
21	Arc	18320.68	18341.102	125	12	Right	20.422	2	1	1	1	1	0	1	0
22	Arc	18416.44	18454.847	40	6	Right	38.407	7	4	1	1	1	1	1	0
23	Arc	18514.794	18520.17	80	8	Left	5.376	1	1	1	1	1	0	1	0
25	Arc	18587.113	18591.291	90	8	Left	4.178	1	1	1	1	1	1	1	0
26	Arc	18744.395	18758.384	20	6	Right	13.989	3	2	1	1	1	0	1	0
27	Arc	18809.765	18896.786	80	8	Left	87.021	11	6	1	1	1	0	1	0
28	Arc	18937.046	18946.141	40	6	Right	9.095	2	1	1	1	1	0	1	0
29	Arc	18993.595	19033.39	20	6	Left	39.795	7	4	1	1	1	1	1	0
31	Arc	19120.021	19171.313	60	8	Left	51.292	7	4	1	1	1	1	1	0
33	Arc	19265.274	19316.512	70	8	Left	51.238	7	4	1	1	1	0	1	0
34	Arc	19371.607	19400.033	60	8	Right	28.426	4	2	1	1	1	0	1	0
35	Arc	19444.949	19491.667	60	8	Right	46.718	6	3	1	1	1	0	1	0
38	Arc	19527.393	19550.507	70	8	Right	23.114	3	2	1	1	1	0	1	0
39	Arc	19595.497	19635.196	20	6	Right	39.699	7	4	1	1	1	0	1	0
41	Arc	19687.62	19727.591	30	6	Right	39.971	7	4	1	1	1	1	1	0
43	Arc	19838.889	19881.346	40	6	Left	42.457	8	4	1	1	1	1	1	0
44	Arc	19981.747	19997.132	50	8	Left	15.385	2	1	1	1	1	1	1	0
45	Arc	20109.917	20114.024	45	6	Right	4.107	1	1	1	1	1	0	1	0
46	Arc	20154.919	20201.412	35	6	Right	46.493	8	4	1	1	1	0	1	0
47	Arc	20237.479	20253.319	30	6	Right	15.840	3	2	1	1	1	0	1	0
48	Arc	20287.431	20474.045	80	8	Left	186.614	24	12	1	1	1	1	1	0
51	Arc	20599.101	20635.815	40	6	Right	36.714	7	4	1	1	1	1	1	0



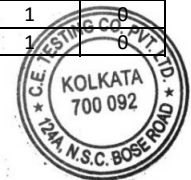
HIP / CURVE NO.	ELEMENT	START CHAINAGE	END CHAINAGE	RADIUS (M)	Spacing on Curve (S)	HAND OF ARC	Length	Nos in outside curve (s)	Nos in inner curve (2s)	1.8s beginning of curve	1.8s end of curve	3s beginning of curve	3s end of curve	6s beginning of curve	6s end of curve
					as per IRC:79- 1981										
52	Arc	20834.46	20868.451	20	6	Right	33.991	6	3	1	1	1	1	1	0
53	Arc	20941.295	20983.172	50	8	Left	41.877	6	3	1	1	1	0	1	0
54	Arc	21026.595	21077.13	200	20	Left	50.535	3	2	0	0	1	0	1	0
55	Arc	21137.937	21168.009	80	8	Left	30.072	4	2	1	1	1	1	1	0
56	Arc	21253	21263.871	30	6	Left	10.871	2	1	1	1	1	0	1	0
57	Arc	21295.179	21334.238	30	6	Left	39.059	7	4	1	1	1	1	1	1
58	Arc	21506.388	21545.145	30	6	Left	38.757	7	4	1	1	1	1	1	0
59	Arc	21610.682	21627.985	25	8	Left	17.303	3	2	1	1	1	0	1	0
60	Arc	21672.72	21694.68	30	6	Left	21.960	4	2	1	1	1	1	1	0
61	Arc	21777.789	21818.726	20	6	Left	40.937	7	4	1	1	1	1	1	1
62	Arc	21948.61	21966.074	20	6	Left	17.464	3	2	1	1	1	1	1	0
63	Arc	22043.733	22047.957	60	8	Left	4.224	1	1	1	1	1	0	1	0
64	Arc	22093.99	22131.178	50	8	Left	37.188	5	3	1	1	1	0	1	0
65	Arc	22201.462	22210.664	30	6	Left	9.202	2	1	1	1	1	1	1	0
66	Arc	22270.712	22305.453	30	6	Left	34.741	6	3	1	1	1	1	1	0
67	Arc	22405.36	22458.318	45	6	Left	52.958	9	5	1	1	1	0	1	0
68	Arc	22506.509	22518.409	50	8	Left	11.900	2	1	1	1	1	0	1	0
69	Arc	22558.599	22641.383	50	8	Left	82.784	11	6	1	1	1	0	1	0
70	Arc	22679.055	22757.421	125	12	Left	78.366	7	4	0	1	1	1	1	0
71	Arc	22880.505	22895.113	40	6	Left	14.608	3	2	1	1	1	1	1	0
72	Arc	22953.228	23003.228	300	25	Left	50.000	2	1	0	0	1	0	1	0
73	Arc	23048.987	23156.604	300	25	Left	107.617	5	3	0	0	1	0	1	0
74	Arc	23188.274	23218.531	20	6	Left	30.257	6	3	1	1	1	0	1	0
75	Arc	23257.156	23343.744	65	8	Left	86.588	11	6	1	1	1	0	1	0
76	Arc	23389.792	23415.696	20	6	Left	25.904	5	3	1	1	1	0	1	0
77	Arc	23461.795	23572.544	180	12	Left	110.749	10	5	1	0	1	0	1	0
78	Arc	23606.009	23701.625	70	8	Left	95.616	12	6	1	1	1	0	1	0
79	Arc	23743.68	23748.059	80	8	Left	4.379	1	1	1	1	1	0	1	0
80	Arc	23817.566	23841.288	80	8	Left	23.722	3	2	1	1	1	0	1	0
81	Arc	23890.56	23903.545	100	12	Left	12.985	2	1	1	1	1	1	1	0
82	Arc	24144.144	24203.92	70	8	Left	59.776	8	4	1	1	1	1	1	0
83	Arc	24329.981	24344.039	50	8	Left	14.058	2	1	1	1	1	1	1	0
84	Arc	24468.814	24483.275	60	8	Left	14.461	2	1	1	1	1	0	1	0
85	Arc	24550.101	24557.2	70	8	Left	7.099	1	1	1	1	1	0	1	0
86	Arc	24624.048	24700.084	100	12	Left	76.036	7	4	1	1	1	0	1	0
87	Arc	24749.284	24770.083	180	12	Left	20.799	2	1	1	1	1	1	1	0
88	Arc	24889.519	24932.979	70	8	Left	43.460	6	3	1	1	1	1	1	0
89	Arc	25053	25059.216	40	6	Left	6.216	2	1	1	1	1	0	1	0
90	Arc	25085.663	25243.193	300	25	Left	157.530	7	4	0	0	1	0	1	0
91	Arc	25263.99	25286.77	50	8	Left	22.780	3	2	0	1	1	0	1	0



HIP / CURVE NO.	ELEMENT	START CHAINAGE	END CHAINAGE	RADIUS (M)	Spacing on Curve (S)	HAND OF ARC	Length	Nos in outside curve (s)	Nos in inner curve (2s)	1.8s beginning of curve	1.8s end of curve	3s beginning of curve	3s end of curve	6s beginning of curve	6s end of curve
					as per IRC:79- 1981										
92	Arc	25340.999	25374.431	20	6	Left	33.432	6	3	1	1	1	1	1	0
93	Arc	25491.637	25524.686	40	6	Left	33.049	6	3	1	1	1	1	1	1
94	Arc	25670.619	25692.551	50	8	Left	21.932	3	2	1	1	1	1	1	0
95	Arc	25820.808	25834.094	70	8	Left	13.286	2	1	1	1	1	0	1	0
96	Arc	25898.339	25909.968	80	8	Left	11.629	2	1	1	1	1	1	1	0
97	Arc	26012.187	26034.413	20	6	Left	22.226	4	2	1	1	1	0	1	0
98	Arc	26074.633	26084.142	20	6	Left	9.509	2	1	1	1	1	0	1	0
99	Arc	26132.748	26166.078	40	6	Left	33.330	6	3	1	1	1	1	1	0
100	Arc	26229.776	26237.187	60	8	Left	7.411	1	1	1	1	1	0	1	0
101	Arc	26275.959	26292.623	50	8	Left	16.664	3	2	1	1	1	1	1	0
102	Arc	26387.583	26452.322	60	8	Left	64.739	9	5	1	1	1	0	1	0
103	Arc	26498.513	26526.759	80	8	Left	28.246	4	2	1	0	1	0	1	0
104	Arc	26547.15	26582.067	25	8	Left	34.917	5	3	0	1	1	0	1	0
105	Arc	26652.33	26671.545	20	6	Left	19.215	4	2	1	0	1	0	1	0
106	Arc	26692.331	26746.084	80	8	Left	53.753	7	4	0	1	1	0	1	0
107	Arc	26784.641	26788.305	40	6	Left	3.664	1	1	1	1	1	0	1	0
108	Arc	26840.07	26852.536	40	6	Left	12.466	3	2	1	1	1	0	1	0
109	Arc	26888.971	26947.036	180	12	Left	58.065	5	3	0	1	1	0	1	0
110	Arc	26996.065	27028.927	40	6	Left	32.862	6	3	1	1	1	1	1	0
111	Arc	27088.864	27154.05	40	6	Left	65.186	11	6	1	1	1	0	1	0
112	Arc	27201.5	27215.284	20	6	Left	13.784	3	2	1	1	1	1	1	0



HIP / CURVE NO.	ELEMENT	START CHAINAGE	END CHAINAGE	RADIUS (M)	Spacing on Curve (S)	HAND OF ARC	Length	Nos in outside curve (s)	Nos in inner curve (2s)	1.8s beginning of curve	1.8s end of curve	3s beginning of curve	3s end of curve	6s beginning of curve	6s end of curve
					as per IRC:79-1981										
113	Arc	27277.443	27287.199	50	8	Left	9.756	2	1	1	1	1	1	1	0
114	Arc	27420.063	27445.107	50	8	Left	25.044	4	2	1	1	1	0	1	0
115	Arc	27498.198	27536.191	30	6	Left	37.993	7	4	1	1	1	0	1	0
116	Arc	27586.31	27630.784	50	8	Left	44.474	6	3	1	1	1	0	1	0
117	Arc	27676.366	27704.131	40	6	Left	27.765	5	3	1	1	1	1	1	0
118	Arc	27798.609	27837.262	40	6	Left	38.653	7	4	1	1	1	1	1	1
119	Arc	27972.516	28042.194	500	35	Left	69.678	2	1	1	0	1	0	1	0
120	Arc	28159.629	28167.513	30	6	Left	7.884	2	1	1	1	1	0	1	0
121	Arc	28199.431	28228.648	30	6	Left	29.217	5	3	1	1	1	1	1	0
122	Arc	28288.539	28417.225	100	12	Left	128.686	11	6	1	0	1	0	1	0
123	Arc	28442.78	28454.524	20	6	Left	11.744	2	1	1	1	1	0	1	0
124	Arc	28509.734	28539.389	60	8	Left	29.655	4	2	1	1	1	0	1	0
125	Arc	28576.639	28586.342	60	8	Left	9.703	2	1	1	1	1	0	1	0
126	Arc	28657.914	28658.414	70	8	Left	0.500	1	1	1	1	1	0	1	0
127	Arc	28725.308	28748.431	125	12	Left	23.123	2	1	1	1	1	0	1	0
128	Arc	28820.468	28826.869	50	8	Left	6.401	1	1	1	1	1	0	1	0
129	Arc	28879.246	28896.64	30	6	Left	17.394	3	2	1	1	1	1	1	0
130	Arc	28994.186	29096.806	125	12	Left	102.620	9	5	1	1	1	0	1	0
131	Arc	29163.09	29182.215	80	8	Left	19.125	3	2	1	1	1	1	1	0
132	Arc	29279.569	29283.244	50	8	Left	3.675	1	1	1	1	1	1	1	0
133	Arc	29401.382	29455.002	150	12	Left	53.620	5	3	1	0	1	0	1	0
134	Arc	29493.059	29512.99	50	8	Left	19.931	3	2	1	1	1	0	1	0
135	Arc	29581.063	29588.777	100	12	Left	7.714	1	1	1	1	1	0	1	0
136	Arc	29648.863	29657.781	80	8	Left	8.918	2	1	1	1	1	0	1	0
137	Arc	29722.382	29800.407	500	35	Left	78.025	3	2	0	0	1	0	1	0
138	Arc	29839.618	29847.003	135	12	Left	7.385	1	1	0	1	1	0	1	0
139	Arc	29903.868	29943.352	500	35	Left	39.484	2	1	0	0	1	0	1	0
140	Arc	30023.325	30074.928	100	12	Left	51.603	5	3	1	0	1	0	1	0
141	Arc	30117.597	30129.708	40	6	Left	12.111	3	2	1	1	1	1	1	0
142	Arc	30216.475	30234.055	150	12	Left	17.580	2	1	1	0	1	0	1	0
143	Arc	30264.532	30283.779	60	8	Left	19.247	3	2	1	0	1	0	1	0
144	Arc	30300.279	30332.729	180	12	Left	32.450	3	2	0	1	1	0	1	0
145	Arc	30444.415	30456.684	100	12	Left	12.269	2	1	1	0	1	0	1	0
146	Arc	30499.635	30532.837	20	6	Left	33.202	6	3	1	1	1	1	1	1
147	Arc	30783.028	30844.443	90	8	Left	61.415	8	4	1	1	1	0	1	0
148	Arc	30915.611	30939.402	55	8	Left	23.791	3	2	1	1	1	1	1	0
149	Arc	31097.358	31131.169	25	8	Left	33.811	5	3	1	1	1	0	1	0
150	Arc	31206.632	31229.984	50	8	Left	23.352	3	2	1	1	1	0	1	0
151	Arc	31271.321	31305.165	50	8	Left	33.844	5	3	1	1	1	0	1	0
152	Arc	31363.842	31408.4	70	8	Left	44.558	6	3	1	1	1	1	1	0



HIP / CURVE NO.	ELEMENT	START CHAINAGE	END CHAINAGE	RADIUS (M)	Spacing on Curve (s)	HAND OF ARC	Length	Nos in outside curve (s)	Nos in inner curve (2s)	1.8s beginning of curve	1.8s end of curve	3s beginning of curve	3s end of curve	6s beginning of curve	6s end of curve
					as per IRC:79-1981										
153	Arc	31557.593	31569.654	100	12	Left	12.061	2	1	1	1	1	0	1	0
154	Arc	31640.359	31673.704	25	8	Left	33.345	5	3	1	1	1	0	1	0
155	Arc	31730.928	31748.307	80	8	Left	17.379	3	2	1	1	1	0	1	0
156	Arc	31800.042	31813.21	150	12	Left	13.168	2	1	1	0	1	0	1	0
157	Arc	31844.836	31866.318	125	12	Left	21.482	2	1	0	1	1	0	1	0
158	Arc	31961.905	31970.463	60	8	Left	8.558	2	1	1	1	1	0	1	0
159	Arc	32020.99	32030.412	80	8	Left	9.422	2	1	1	1	1	0	1	0
160	Arc	32081.379	32102.102	80	8	Left	20.723	3	2	1	1	1	1	1	0
161	Arc	32188.305	32216.885	60	8	Left	28.580	4	2	1	1	1	0	1	0
162	Arc	32253.591	32307.397	300	25	Left	53.806	3	2	0	0	1	0	1	0
163	Arc	32363.114	32379.989	125	12	Left	16.875	2	1	1	1	1	0	1	0
164	Arc	32436.865	32445.33	80	8	Left	8.465	2	1	1	1	1	1	1	0
165	Arc	32555.143	32561.545	50	8	Left	6.402	1	1	1	1	1	0	1	0
166	Arc	32636.636	32697.773	60	8	Left	61.137	8	4	1	1	1	1	1	0
167	Arc	32791.815	32811.65	50	8	Left	19.835	3	2	1	1	1	0	1	0
168	Arc	32872.761	32883.831	60	8	Left	11.070	2	1	1	1	1	0	1	0
169	Arc	32919.476	32940.356	50	8	Left	20.880	3	2	1	1	1	0	1	0
170	Arc	32988.357	32996.234	50	8	Left	7.877	1	1	1	1	1	0	1	0
171	Arc	33053.854	33088.177	20	6	Left	34.323	6	3	1	0	1	0	1	0
TOTAL							=	680	383	140	136	155	57	155	7

Total No of Road Delineators =

1713 nos.



CALCULATION FOR STREET LIGHTING

Street light in Built Up Location:

TCS Type	Length	Length (m)
TCS-1	550	1100.00
	Total =	1100

Total length = 1100 m

Assuming, street lights @= 50m interval

for 1100 m 23 nos

At Busbay location=
(@ 5 nos per Busbay) 30 nos

Total nos of street light= 53 nos



RAILING

Chainage (km)		Length(km)	Side	Length of CD(m)	Net Length (m)
From	To				
16300	16850	550	Both	3.96	1092.08
				Net Length	1092



Crash Barrier

Chainage (m)		Net Length (m)	Side
From	To		
20300	20500	200.0	Valley
21500	21750	250.0	Valley
22050	22250	200.0	Valley
22380	22625	245.0	Valley
23550	23750	200.0	Valley
24120	24220	100.0	Valley
24850	25100	250.0	Valley
25560	25660	100.0	Valley
26100	26200	100.0	Valley
26480	26630	150.0	Valley
26950	27250	300.0	Valley
27150	27250	100.0	Valley
27550	27650	100.0	Valley
28150	28300	150.0	Valley
28950	29300	350.0	Valley
30480	30580	100.0	Valley
31320	31420	100.0	Valley
31925	31975	50.0	Valley
32130	32280	150.0	Valley
32730	32880	150.0	Valley
Total =		3345.0	

Total no. of Bridges on the project= 2 nos.
 Approach length on valley side for each bridge (25 m on both side) 100
 Hence, Crash barrier length for 2 bridges (m)= 100
 Therefore, total length of crash barrier= 3545




**Reusable Sub-base Base Calculation
GSB Calculation**

	Required GSB Qty	Reusable GSB Quantity	
TCS-01	1310	479.606	Cum
TCS-02	1376	503.798	Cum
TCS-02A	1045	382.631	Cum
TCS-03	25994	9513.922	Cum
TCS-03A	658	240.705	Cum
TCS-04	2654	971.248	Cum
TCS-05	7370	2697.391	Cum
TCS-06	454	166.164	Cum
TCS-07	1844	674.904	Cum
TCS-08	169	61.815	Cum
Busbay (2 Lane)	425	155.477	Cum
Extra Widening on Flexible Pavement	1848	676.441	Cum
Minor Junction	168	61.634	Cum
Structure Minor Bridge	360	131.760	Cum
	45676	16717	

Reusable GSB Quantity= 36.60%

Total Dismantle Granular Quantity(cum)= **27848**
use 60% of Total Dismantle Granular Quantity for GSB (cum)= **16709**

Total Required GSB Qty (Cum)= **45676**
36.6 % of this required quantity will be bought from dismantle material i.e **16717**

Re Useable Quantity of GSB Material(cum)= **16717**
Remaining Quantity of GSB(cum) = **28959**



VOLUME VIII
BILL OF QUANTITY



**BILL OF QUANTITY
(ROAD PART)**



Bill No : 01. Site Clearance and Dismantling

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	02.01/i	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth from 300 mm to 600 mm	Each	5.00		
2	02.01/ii	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 600 mm to 900 mm	Each	22.00		
3	02.01/iii	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 900 mm to 1800 mm	Each	118.00		
4	02.01/iv	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 1800 mm to 2700 mm	Each	23.00		
5	02.01/v	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 2700 mm	Each	23.00		
6	02.03/b	Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by mechanical means)	Ha	29.28		



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Bill No : 01. Site Clearance and Dismantling

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
7	02.04/i/c	Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above	cum	126.00		
8	02.04/iii/b	Dismantling stone masonry b) Rubble stone masonry in cement mortar	Cum	1,656.00		
9	02.04/vii/a	Removing hume pipes class NP-3 a) 300mm to 600mm dia	rm	30.00		
10	02.04/vii/b	Removing hume pipes class NP-4 b) Above 600mm to 900mm dia	rm	340.00		
11	02.04/vii/c	Removing hume pipes class NP-5 c) Above 900mm dia	rm	60.00		
12	02.04/viii/e	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m e)Kandar/Gravel metal crust upto 150 mm thick with power Roller with scarifier	sqm	185,655.00		
13	02.04/viii/f/ii	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base ii)With road roller attached with scarifier	sqm	163,400.00		
Total of Bill 01. Site Clearance and Dismantling						

Bill No : 02. Earth work,Subgrade and Erosion control

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	03.13	Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2	cum	47,996.00		
2	03.14	Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2	cum	54,967.23		
3	03.31	Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres	cum	289,843.20		
4	03.32	Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting. Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres	cum	72,460.80		
Total of Bill 02. Earth work,Subgrade and Erosion control						



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Bill No : 03. Sub-Base & Base Courses

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	04.01/Nsc1	Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material	Cum	28,354.39		
2	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401	Cum	16,368.63		
3	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)	Cum	45,653.84		
Total of Bill 03. Sub-Base & Base Courses						

Bill No : 04. Bituminous Courses

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm	sqm	179,603.00		
2	06.02/ii	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. ii) On granular Surface Pre treated with prime Coat @ 0.25 - 0.30 kg/sqm	sqm	170,362.00		
3	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40	cum	14,368.24		



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Bill No : 04. Bituminous Courses

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
4	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5% of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	7,184.12		
		Total of Bill 04. Bituminous Courses				



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Bill No : 05. Junction Improvement (Major & Minor)

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	04.01/Ns c1	Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material	Cum	106.77		
2	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401	Cum	61.63		
3	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)	Cum	210.50		
4	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm	sqm	842.00		



Bill No : 05. Junction Improvement (Major & Minor)

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
5	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm	sqm	842.00		
6	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40	cum	67.36		
7	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	33.68		
Total of Bill 05. Junction Improvement (Major & Minor)						

Bill No : 06. Traffic signs, Road marking & other road appurtenances

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	08.02/a	Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. a) 5th KM stone	each	3.00		
2	08.02/b	Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. b) Ordinary kilometer stone	each	14.00		
3	08.04	Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting	each	174.00		
4	08.11/i	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm equilateral triangle	each	274.00		
5	08.11/iii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm circular	each	66.00		



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Bill No : 06. Traffic signs, Road marking & other road appurtenances

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
6	08.11/iv	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 80 mm x 60 mm rectangular	each	6.00		
7	08.11/vii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm high octagon	each	17.00		
8	08.14	Road Marking with Hot Applied Thermoplastic Compound with Reflectorisng Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorisng glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.)	sqm	5,644.33		



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Bill No : 06. Traffic signs, Road marking & other road appurtenances

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
9	08.15/c/v	Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming to IRC-79 and the drawings.) 120x120 -Road Delineator	each	2,005.00		
10	08.18/A/b	Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.5 m	Rm	3,545.00		
11	08.20/ii	Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973 Light Reflecting Lense Type	nos	9,726.00		
12	08.22	Lighting on Bridges Providing & fixing lighting on Bridges, mounted on steel hollow circular poles of standard specification, 5 m high fixed on parapets with cement concrete, 20 m apart and fitted with sodium vapour lamp	nos	53.00		
13	08/nsc/2	Convex Mirror For Blind Curve	nos	36.00		



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Bill No : 06. Traffic signs, Road marking & other road appurtenances

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
14	08/nsc/6	Rumble Strips Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint.	sqm	580.00		
15	16.09	Mild steel railling complete as per drawing and Technical Specifications	Rm	1,092.00		
		Total of Bill	06. Traffic signs, Road marking & other road appurtenances			



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Bill No : 07. Passenger Shelter

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	396.41		
2	10.16	Cement Plaster 12mm Thick in Cement Morter 1:3	sqm	396.41		
3	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	59.45		
4	14.01	Brick masonry work in cement mortar 1:3 in foundation complete excluding pointing and plastering, as per drawing and technical specifications	cum	9.11		
5	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	6.04		
6	14.03/e/l	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M25Grade	cum	4.16		
7	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification	MT	0.50		
8	14/nsc2	Brick Flat Soling at Foundation	Sqm	80.63		
9	15.01	Brick masonry work in cement mortar 1:3 in Sub-structure complete excluding pointing and plastering, as per drawing and technical specifications	cum	19.43		



Bill No : 07. Passenger Shelter

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
10	16.01/a/i	cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complet eas per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m	cum	24.91		
11	16.03	HYSD bar reinforcement in super-structure complete as per drawing and technical specifications	MT	2.49		
Total of Bill 07. Passenger Shelter						



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Bill No : 08. Bus Bay

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	03.14/Nsc	Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from Roadway Cutting with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2	cum	1,062.00		
2	04.01/Nsc1	Sub-base with Close Graded Material (Table:-400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material	Cum	269.32		
3	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401	Cum	155.48		
4	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)	Cum	531.00		



Bill No : 08. Bus Bay

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
5	05.03	Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar including provision of all drainage arrangements but excluding kerb channel.	sqm	885.00		
6	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm	sqm	2,124.00		
7	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm	sqm	2,124.00		
8	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40	cum	169.92		



Bill No : 08. Bus Bay

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
9	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5% of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	84.96		
		Total of Bill 08. Bus Bay				



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Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	24,726.37		
2	14.02/b	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	7,843.73		
3	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	481.46		
4	14.03/b	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M20 Grade	cum	63.47		
5	15.02/b	Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	867.34		
6	15.03/b/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m	cum	147.14		
7	15.03/f/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height	cum	2,077.05		



Bill No : 09. Longitudinal Drains

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
8	15.05	HYSB bar reinforcement in Sub-structure complete as per drawing and technical specification	MT	103.85		
9	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	1,236.50		
10	24/i/b	Galvanised Mild steel J /L hook	kg	197.52		
11	40	Gextextile material (fine net)	sqm	222.21		
Total of Bill 09. Longitudinal Drains						



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Bill No : 10. Retaining wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	1,715.02		
2	13.01/b/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to	cum	428.76		
3	13.04	Filter medium behind abutment,wing wall and return wall complete as per drawing and technical specification .	cum	1,463.24		
4	14.02/b	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	921.10		
5	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	524.15		
6	15.02/b	Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	1,287.09		
7	15.03/b/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m	cum	144.44		
8	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	2,206.00		



		Total of Bill	10. Retaining wall	
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Bill No : 11. Breast wall

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	10,108.76		
2	13.01/b/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to	cum	2,527.19		
3	13.03/a	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials	cum	1,767.93		
4	13.03/b	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material	cum	513.27		
5	14.02/b	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	4,749.80		
6	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	2,204.78		
7	15.02/b	Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification Random Rubble Masonry (coursed/uncoursed)	cum	7,268.16		
8	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	3,770.32		
Total of Bill 11. Breast wall						



QUANTITY CALCULATION (ROAD PART)



Quantity Backup Calculation For Bill : 01. Site Clearance and Dismantling

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	02.01/i	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth from 300 mm to 600 mm			
		Refer: Site Clearance and Dismantling Formula: 5	5	5.00	Each
			Total :	5.00	Each
2	02.01/ii	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 600 mm to 900 mm			
		Refer: Site Clearance and Dismantling Formula: 22	22	22.00	Each
			Total :	22.00	Each
3	02.01/iii	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 900 mm to 1800 mm			
		Refer: Site Clearance and Dismantling Formula: 118	118	118.00	Each
			Total :	118.00	Each
4	02.01/iv	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 1800 mm to 2700 mm			
		Refer: Site Clearance and Dismantling Formula: 23	23	23.00	Each
			Total :	23.00	Each



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
5	02.01/v	Cutting of Trees, including cutting of trunks, branches and removal of stumps including stacking of serviceable materials within a lead of 100 m. and earth filling in the depression/pit. Girth above 2700 mm			
		Refer: Site Clearance and Dismantling Formula: 23	23	23.00	Each
			Total :	23.00	Each
6	02.03/b	Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable materials and stacking of serviceable materials and stacking of serviceable materials upto 100m. from road boundary. (by mechanical means)			
		Refer: Site Clearance and Dismantling Formula: 29.28	29.28	29.28	Ha
			Total :	29.28	Ha
7	02.04/i/c	Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above			
		Refer: Site Clearance and Dismantling Formula: 126	126	126.00	cum
			Total :	126.00	cum
8	02.04/iii/b	Dismantling stone masonry b) Rubble stone masonry in cement mortar			
		Refer: Site Clearance and Dismantling Formula: 1656	1656	1,656.00	Cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
			Total :	1,656.00	Cum
9	02.04/vii/a	Removing hume pipes class NP-3 a) 300mm to 600mm dia			
		Refer: Site Clearance and Dismantling Formula: 30	30	30.00	rm
			Total :	30.00	rm
10	02.04/vii/b	Removing hume pipes class NP-4 b) Above 600mm to 900mm dia			
		Refer: Site Clearance and Dismantling Formula: 340	340	340.00	rm
			Total :	340.00	rm
11	02.04/vii/c	Removing hume pipes class NP-5 c) Above 900mm dia			
		Refer: Site Clearance and Dismantling Formula: 60	60	60.00	rm
			Total :	60.00	rm
12	02.04/viii/e	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m e)Kandar/Gravel metal crust upto 150 mm thick with power Roller with scarifier			
		Refer: Site Clearance and Dismantling Formula: 185655	185655	185,655.00	sqm
			Total :	185,655.00	sqm

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
13	12.04/viii/f/i	Scarifying including picking up scarified material and stacking of old serviceable material within a lead of 100m f)Bituminous coarses 50-70mm along with premix Carpet and Surface dressing but without disturbing the base ii)With road roller attached with scarifier			
		Refer: Site Clearance and Dismantling Formula: 163400	163400	163,400.00	sqm
			Total :	163,400.00	sqm




SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	03.13	Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2			
		Refer: Earthwork Formula: tot_fill	47996.000	47,996.00	cum
			Total :	47,996.00	cum
2	03.14	Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2			
		Refer: TCS-01 Formula: (cw+2*ps-ext_pav)*l*sg	$(7.000+2*2.500-6.700)*546.000*0.500$	1,446.90	cum
		Refer: TCS-02 Formula: (cw+2*ps+2*es-ext_pav+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*l*sg+es_area*2*l	$(7.000+2*1.500+2*1.000-6.700+(0.040+0.080+0.125+0.125+0.200+0.5*0.500)*1*2)*474.000*0.500+0.343*2*474.000$	1,969.94	cum
		Refer: TCS-02A Formula: (cw+2*ps+2*es-ext_pav+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*l*sg+es_area*2*l	$(7.000+2*1.500+2*1.000-6.700+(0.040+0.080+0.125+0.125+0.200+0.5*0.500)*1*2)*360.000*0.500+0.343*2*360.000$	1,496.16	cum
		Refer: TCS-03 Formula: (cw+2*ps+1*es-ext_pav+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*l*sg+es_area*1*l	$(7.000+2*1.500+1*1.000-6.700+(0.040+0.080+0.125+0.125+0.200+0.5*0.500)*1*2)*10158.000*0.500+0.315*1*10158.000$	33,369.03	cum
		Refer: TCS-03A Formula: (cw+2*ps+1*es-ext_pav+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*l*sg+es_area*1*l	$(7.000+2*1.500+1*1.000-0.000+(0.040+0.080+0.125+0.125+0.200+0.5*0.500)*1*2)*257.000*0.500+0.315*1*257.000$	1,705.20	cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-04 Formula: (cw+2*ps+1*es-ext_pav+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*l*sg+es_area*1*l	(7.000+2*1.500+1*1.000-6.700+(0.040+0.080+0.125+0.125+0.200+0.5*0.500)*1*2)*1037.000*0.500+0.315*1*1037.000	3,406.55	cum
		Refer: TCS-05 Formula: (cw+2*ps+1*es-ext_pav+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*l*sg+es_area*1*l	(7.000+2*1.500+1*1.000-6.700+(0.040+0.080+0.125+0.125+0.200+0.5*0.500)*1*2)*2880.000*0.500+0.315*1*2880.000	9,460.80	cum
		Refer: TCS-06 Formula: (cw+2*ps-ext_pav)*l*sg	(7.000+2*1.500-6.700)*227.000*0.500	374.55	cum
		Refer: TCS-07 Formula: (cw+2*ps-ext_pav)*l*sg	(7.000+2*1.500-6.700)*922.000*0.500	1,521.30	cum
		Refer: TCS-08 Formula: (cw+2*ps+1*es-ext_pav+(bc+dbm+wmm1+wmm2+gsb+0.5*sg)*1*2)*l*sg+es_area*1*l	(7.000+2*1.500+1*1.000-6.700+(0.040+0.080+0.125+0.125+0.200+0.5*0.500)*1*2)*66.000*0.500+0.315*1*66.000	216.81	cum
			Total :	54,967.23	cum
3	03.31	Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres			
		Refer: Earthwork Formula: tot_cut*(1-per_rock/100)	362304.000*(1-20.000/100)	289,843.20	cum
			Total :	289,843.20	cum
4	03.32	Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting. Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres			
		Refer: Earthwork Formula: tot_cut*(per_rock/100)	362304.000*(20.000/100)	72,460.80	cum
			Total :	72,460.80	cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	04.01/Nsc1	Sub-base with Close Graded Material (Table: - 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material			
		Refer: Extra Widening on Flexible Formula: Pavement $ew_area*gsb*(1-gsb_per/100)$	$9241.000*0.200*(1-36.600/100)$	1,171.76	Cum
		Refer: TCS-01 Formula: $(cw+2*ps)*gsb*(1-gsb_per/100)$	$(7.000+2*2.500)*0.200*546.000*(1-36.600/100)$	830.79	Cum
		Refer: TCS-02 Formula: $((cw+2*ps+2*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*1*2)*1*gsb+es_gsb*2*I)*(1-gsb_per/100)$	$((7.000+2*1.500+2*1.000+(0.040+0.080+0.125+0.125+0.200*0.5)*1*2)*474.000*0.200+0.158*2*474.000*(1-36.600/100)$	872.70	Cum
		Refer: TCS-02A Formula: $((cw+2*ps+2*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*1*2)*1*gsb+es_gsb*2*I)*(1-gsb_per/100)$	$((7.000+2*1.500+2*1.000+(0.040+0.080+0.125+0.125+0.200*0.5)*1*2)*360.000*0.200+0.158*2*360.000*(1-36.600/100)$	662.81	Cum
		Refer: TCS-03 Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*1*gsb+es_gsb*1*I)*(1-gsb_per/100)$	$((7.000+2*1.500+1*1.000+(0.040+0.080+0.125+0.125+0.200*0.5)*2*1)*10158.000*0.200+0.171*1*10158.000*(1-36.600/100)$	16,480.40	Cum
		Refer: TCS-03A Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*1*gsb+es_gsb*1*I)*(1-gsb_per/100)$	$((7.000+2*1.500+1*1.000+(0.040+0.080+0.125+0.125+0.200*0.5)*2*1)*257.000*0.200+0.171*1*257.000*(1-36.600/100)$	416.96	Cum
		Refer: TCS-04 Formula: $((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*1*gsb+es_gsb*1*I)*(1-gsb_per/100)$	$((7.000+2*1.500+1*1.000+(0.040+0.080+0.125+0.125+0.200*0.5)*2*1)*1037.000*0.200+0.171*1*1037.000*(1-36.600/100)$	1,682.44	Cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-05 Formula: ((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1)*(1-gsb_per/100)	((7.000+2*1.500+1*1.000+(0.040+0.080+0.125+0.125+0.200*0.5)*2*1)*2880.000*0.200+0.171*1*2880.000*(1-36.600/100)	4,672.53	Cum
		Refer: TCS-06 Formula: (cw+2*ps)*gsb*(1-gsb_per/100)	(7.000+2*1.500)*0.200*227.000*(1-36.600/100)	287.84	Cum
		Refer: TCS-07 Formula: (cw+2*ps)*gsb*(1-gsb_per/100)	(7.000+2*1.500)*0.200*922.000*(1-36.600/100)	1,169.10	Cum
		Refer: TCS-08 Formula: ((cw+2*ps+1*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1)*(1-gsb_per/100)	((7.000+2*1.500+1*1.000+(0.040+0.080+0.125+0.125+0.200*0.5)*2*1)*66.000*0.200+0.171*1*66.000*(1-36.600/100)	107.08	Cum
			Total :	28,354.39	Cum
2	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401			
		Refer: Extra Widening on Flexible Formula:Pavement ew_area*gsb*(gsb_per/100)	9241.000*0.200*(36.600/100)	676.44	Cum
		Refer: TCS-01 Formula: (cw+2*ps)*gsb*(gsb_per/100)	(7.000+2*2.500)*0.200*546.000*(36.600/100)	479.61	Cum
		Refer: TCS-02 Formula: ((cw+2*ps+2*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*1*2)*gsb+es_gsb*2*1)*(gsb_per/100)	((7.000+2*1.500+2*1.000+(0.040+0.080+0.125+0.125+0.200*0.5)*1*2)*474.000*0.200+0.158*2*474.000*(36.600/100)	503.80	Cum
		Refer: TCS-02A Formula: ((cw+2*ps+2*es+(bc+dbm+wmm1+wmm2+gsb*0.5)*1*2)*gsb+es_gsb*2*1)*(gsb_per/100)	((7.000+2*1.500+2*1.000+(0.040+0.080+0.125+0.125+0.200*0.5)*1*2)*360.000*0.200+0.158*2*360.000*(36.600/100)	382.63	Cum



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SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-03 Formula: ((cw+2*ps+1*es+ (bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1*I)*(gsb_per/100)	((7.000+2*1.500+1*1.000+ (0.040+0.080+0.125+0.125+0.200*0.5) *2*1) *10158.000*0.200+0.171*1*10158.000) *(36.600/100)	9,513.92	Cum
		Refer: TCS-03A Formula: ((cw+2*ps+1*es+ (bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1*I)*(gsb_per/100)	((7.000+2*1.500+1*1.000+ (0.040+0.080+0.125+0.125+0.200*0.5) *2*1) *257.000*0.200+0.171*1*257.000)* (36.600/100)	240.71	Cum
		Refer: TCS-04 Formula: ((cw+2*ps+1*es+ (bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1*I)*(gsb_per/100)	((7.000+2*1.500+1*1.000+ (0.040+0.080+0.125+0.125+0.200*0.5) *2*1) *1037.000*0.200+0.171*1*1037.000)* (36.600/100)	971.25	Cum
		Refer: TCS-05 Formula: ((cw+2*ps+1*es+ (bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1*I)*(gsb_per/100)	((7.000+2*1.500+1*1.000+ (0.040+0.080+0.125+0.125+0.200*0.5) *2*1) *2880.000*0.200+0.171*1*2880.000)* (36.600/100)	2,697.39	Cum
		Refer: TCS-06 Formula: (cw+2*ps)*gsb*I*(gsb_per/100)	(7.000+2*1.500)*0.200*227.000* (36.600/100)	166.16	Cum
		Refer: TCS-07 Formula: (cw+2*ps)*gsb*I*(gsb_per/100)	(7.000+2*1.500)*0.200*922.000* (36.600/100)	674.90	Cum
		Refer: TCS-08 Formula: ((cw+2*ps+1*es+ (bc+dbm+wmm1+wmm2+gsb*0.5)*2*1)*gsb+es_gsb*1*I)*(gsb_per/100)	((7.000+2*1.500+1*1.000+ (0.040+0.080+0.125+0.125+0.200*0.5) *2*1)*66.000*0.200+0.171*1*66.000)* (36.600/100)	61.82	Cum
			Total :	16,368.63	Cum
3	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)			
		Refer: Extra Widening on Flexible Formula:Pavement ew_area*(wmm1+wmm2)	9241.000*(0.125+0.125)	2,310.25	Cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-01 Formula: (((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)	(((7.000+2*2.500)*0.125)+ ((7.000+2*2.500)*0.125))*546.000)	1,638.00	Cum
		Refer: TCS-02 Formula: (((cw+2*ps+0.125*2)*wmm1)+ ((cw+2*ps+0.250*2)*wmm2))*I)	(((7.000+2*1.500+0.125*2)*0.125)+ ((7.000+2*1.500+0.250*2)*0.125)) *474.000)	1,229.44	Cum
		Refer: TCS-02A Formula: (((cw+2*ps+0.125*2)*wmm1)+ ((cw+2*ps+0.250*2)*wmm2))*I)	(((7.000+2*1.500+0.125*2)*0.125)+ ((7.000+2*1.500+0.250*2)*0.125)) *360.000)	933.75	Cum
		Refer: TCS-03 Formula: (((cw+2*ps+0.125*1)*wmm1)+ ((cw+2*ps+0.250*1)*wmm2))*I)	(((7.000+2*1.500+0.125*1)*0.125)+ ((7.000+2*1.500+0.250*1)*0.125)) *10158.000)	25,871.16	Cum
		Refer: TCS-03A Formula: (((cw+2*ps+0.125*1)*wmm1)+ ((cw+2*ps+0.250*1)*wmm2))*I)	(((7.000+2*1.500+0.125*1)*0.125)+ ((7.000+2*1.500+0.250*1)*0.125)) *257.000)	654.55	Cum
		Refer: TCS-04 Formula: (((cw+2*ps+0.125*1)*wmm1)+ ((cw+2*ps+0.250*1)*wmm2))*I)	(((7.000+2*1.500+0.125*1)*0.125)+ ((7.000+2*1.500+0.250*1)*0.125)) *1037.000)	2,641.11	Cum
		Refer: TCS-05 Formula: (((cw+2*ps+0.125*1)*wmm1)+ ((cw+2*ps+0.250*1)*wmm2))*I)	(((7.000+2*1.500+0.125*1)*0.125)+ ((7.000+2*1.500+0.250*1)*0.125)) *2880.000)	7,335.00	Cum
		Refer: TCS-06 Formula: (((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)	(((7.000+2*1.500)*0.125)+ ((7.000+2*1.500)*0.125))*227.000)	567.50	Cum
		Refer: TCS-07 Formula: (((cw+2*ps)*wmm1)+((cw+2*ps)*wmm2))*I)	(((7.000+2*1.500)*0.125)+ ((7.000+2*1.500)*0.125))*922.000)	2,305.00	Cum
		Refer: TCS-08 Formula: (((cw+2*ps+0.125*1)*wmm1)+ ((cw+2*ps+0.250*1)*wmm2))*I)	(((7.000+2*1.500+0.125*1)*0.125)+ ((7.000+2*1.500+0.250*1)*0.125)) *66.000)	168.09	Cum
			Total :	45,653.84	Cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm			
		Refer: Extra Widening on Flexible Formula: Pavement ew_area	9241.000	9,241.00	sqm
		Refer: TCS-01 Formula: (cw+2*ps)*l	(7.000+2*2.500)*546.000	6,552.00	sqm
		Refer: TCS-02 Formula: (cw+2*ps)*l	(7.000+2*1.500)*474.000	4,740.00	sqm
		Refer: TCS-02A Formula: (cw+2*ps)*l	(7.000+2*1.500)*360.000	3,600.00	sqm
		Refer: TCS-03 Formula: (cw+2*ps)*l	(7.000+2*1.500)*10158.000	101,580.00	sqm
		Refer: TCS-03A Formula: (cw+2*ps)*l	(7.000+2*1.500)*257.000	2,570.00	sqm
		Refer: TCS-04 Formula: (cw+2*ps)*l	(7.000+2*1.500)*1037.000	10,370.00	sqm
		Refer: TCS-05 Formula: (cw+2*ps)*l	(7.000+2*1.500)*2880.000	28,800.00	sqm
		Refer: TCS-06 Formula: (cw+2*ps)*l	(7.000+2*1.500)*227.000	2,270.00	sqm
		Refer: TCS-07 Formula: (cw+2*ps)*l	(7.000+2*1.500)*922.000	9,220.00	sqm
		Refer: TCS-08 Formula: (cw+2*ps)*l	(7.000+2*1.500)*66.000	660.00	sqm
			Total :	179,603.00	sqm

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
2	06.02/ii	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. ii) On granular Surface Pre treated with prime Coat @ 0.25 - 0.30 kg/sqm			
		Refer: TCS-01 Formula: (cw+2*ps)*l	(7.000+2*2.500)*546.000	6,552.00	sqm
		Refer: TCS-02 Formula: (cw+2*ps)*l	(7.000+2*1.500)*474.000	4,740.00	sqm
		Refer: TCS-02A Formula: (cw+2*ps)*l	(7.000+2*1.500)*360.000	3,600.00	sqm
		Refer: TCS-03 Formula: (cw+2*ps)*l	(7.000+2*1.500)*10158.000	101,580.00	sqm
		Refer: TCS-03A Formula: (cw+2*ps)*l	(7.000+2*1.500)*257.000	2,570.00	sqm
		Refer: TCS-04 Formula: (cw+2*ps)*l	(7.000+2*1.500)*1037.000	10,370.00	sqm
		Refer: TCS-05 Formula: (cw+2*ps)*l	(7.000+2*1.500)*2880.000	28,800.00	sqm
		Refer: TCS-06 Formula: (cw+2*ps)*l	(7.000+2*1.500)*227.000	2,270.00	sqm
		Refer: TCS-07 Formula: (cw+2*ps)*l	(7.000+2*1.500)*922.000	9,220.00	sqm
		Refer: TCS-08 Formula: (cw+2*ps)*l	(7.000+2*1.500)*66.000	660.00	sqm
			Total :	170,362.00	sqm

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
3	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40			
		Refer: Extra Widening on Flexible Formula: Pavement $ew_area*dbm$	$9241.000*0.080$	739.28	cum
		Refer: TCS-01 Formula: $(cw+2*ps)*dbm*I$	$(7.000+2*2.500)*0.080*546.000$	524.16	cum
		Refer: TCS-02 Formula: $(cw+2*ps)*dbm*I$	$(7.000+2*1.500)*0.080*474.000$	379.20	cum
		Refer: TCS-02A Formula: $(cw+2*ps)*dbm*I$	$(7.000+2*1.500)*0.080*360.000$	288.00	cum
		Refer: TCS-03 Formula: $(cw+2*ps)*dbm*I$	$(7.000+2*1.500)*0.080*10158.000$	8,126.40	cum
		Refer: TCS-03A Formula: $(cw+2*ps)*dbm*I$	$(7.000+2*1.500)*0.080*257.000$	205.60	cum
		Refer: TCS-04 Formula: $(cw+2*ps)*dbm*I$	$(7.000+2*1.500)*0.080*1037.000$	829.60	cum
		Refer: TCS-05 Formula: $(cw+2*ps)*dbm*I$	$(7.000+2*1.500)*0.080*2880.000$	2,304.00	cum
		Refer: TCS-06 Formula: $(cw+2*ps)*dbm*I$	$(7.000+2*1.500)*0.080*227.000$	181.60	cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-07 Formula: (cw+2*ps)*dbm*l	$(7.000+2*1.500)*0.080*922.000$	737.60	cum
		Refer: TCS-08 Formula: (cw+2*ps)*dbm*l	$(7.000+2*1.500)*0.080*66.000$	52.80	cum
			Total :	14,368.24	cum
4	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40			
		Refer: Extra Widening on Flexible Formula:Pavement ew_area*bc	$9241.000*0.040$	369.64	cum
		Refer: TCS-01 Formula: (cw+2*ps)*bc*l	$(7.000+2*2.500)*0.040*546.000$	262.08	cum
		Refer: TCS-02 Formula: (cw+2*ps)*bc*l	$(7.000+2*1.500)*0.040*474.000$	189.60	cum
		Refer: TCS-02A Formula: (cw+2*ps)*bc*l	$(7.000+2*1.500)*0.040*360.000$	144.00	cum
		Refer: TCS-03 Formula: (cw+2*ps)*bc*l	$(7.000+2*1.500)*0.040*10158.000$	4,063.20	cum
		Refer: TCS-03A Formula: (cw+2*ps)*bc*l	$(7.000+2*1.500)*0.040*257.000$	102.80	cum
		Refer: TCS-04 Formula: (cw+2*ps)*bc*l	$(7.000+2*1.500)*0.040*1037.000$	414.80	cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-05 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*2880.000$	1,152.00	cum
		Refer: TCS-06 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*227.000$	90.80	cum
		Refer: TCS-07 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*922.000$	368.80	cum
		Refer: TCS-08 Formula: (cw+2*ps)*bc*I	$(7.000+2*1.500)*0.040*66.000$	26.40	cum
			Total :	7,184.12	cum




SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	04.01/Nsc1	Sub-base with Close Graded Material (Table: - 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material			
		Refer: Minor Junction Formula: tot_area*gsb*(1-gsb_per/100)	$842.000*0.200*(1-36.600/100)$	106.77	Cum
			Total :	106.77	Cum
2	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401			
		Refer: Minor Junction Formula: tot_area*gsb*(gsb_per/100)	$842.000*0.200*(36.600/100)$	61.63	Cum
			Total :	61.63	Cum
3	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)			
		Refer: Minor Junction Formula: tot_area*(wmm1+wmm2)	$842.000*(0.125+0.125)$	210.50	Cum
			Total :	210.50	Cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
4	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm			
		Refer: Minor Junction Formula: tot_area	842.000	842.00	sqm
			Total :	842.00	sqm
5	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20- 0.30 kg/sqm			
		Refer: Minor Junction Formula: tot_area	842.000	842.00	sqm
			Total :	842.00	sqm
6	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40			
		Refer: Minor Junction Formula: tot_area*dbm	842.000*0.080	67.36	cum
			Total :	67.36	cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
7	06/Nsc2	<p>Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects</p> <p>B) Grading-II (13 mm nominal size)</p> <p>iii)Using bitumen 30/40</p>			
		<p>Refer: Minor Junction</p> <p>Formula: tot_area*bc</p>	842.000*0.040	33.68	cum
			Total :	33.68	cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	08.02/a	Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. a) 5th KM stone			
		Refer: Traffic Signs Formula: 3	3	3.00	each
			Total :	3.00	each
2	08.02/b	Reinforced cement concrete M15 kilometer stone of standard design fixed in Position including painting and painting letters etc. b) Ordinary kilometer stone			
		Refer: Traffic Signs Formula: 14	14	14.00	each
			Total :	14.00	each
3	08.04	Reinforced Cement Concrete M15 Boundary pillars of standard design, fixed in position including finishing but excluding painting			
		Refer: Traffic Signs Formula: 174	174	174.00	each
			Total :	174.00	each
4	08.11/i	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and inforatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm equilateral triangle			
		Refer: Traffic Signs Formula: 274	274	274.00	each
			Total :	274.00	each

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
5	08.11/iii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 60 cm circular			
		Refer: Traffic Signs Formula: 66	66	66.00	each
			Total :	66.00	each
6	08.11/iv	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 80 mm x 60 mm rectangular			
		Refer: Traffic Signs Formula: 6	6	6.00	each
			Total :	6.00	each

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
7	08.11/vii	Retro- reflectorised Traffic signs Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing) 90 cm high octagon			
		Refer: Traffic Signs Formula: 17	17	17.00	each
			Total :	17.00	each
8	08.14	Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.)			
		Refer: TCS-01 Formula: (((l+6)/9)*lc*wc)+(nc*I*wid_mar)	$\frac{((546.000+6)/9)*3.000*0.100}{(2.000*546.000*0.150)}$	182.20	sqm
		Refer: TCS-02 Formula: (((l+6)/9)*lc*wc)+(nc*I*wid_mar)	$\frac{((474.000+6)/9)*3.000*0.100}{(2.000*474.000*0.150)}$	158.20	sqm
		Refer: TCS-02A Formula: (((l+6)/9)*lc*wc)+(nc*I*wid_mar)	$\frac{((360.000+6)/9)*3.000*0.100}{(2.000*360.000*0.150)}$	120.20	sqm
		Refer: TCS-03 Formula: (((l+6)/9)*lc*wc)+(nc*I*wid_mar)	$\frac{((10158.000+6)/9)*3.000*0.100}{(2.000*10158.000*0.150)}$	3,386.20	sqm
		Refer: TCS-03A Formula: (((l+6)/9)*lc*wc)+(nc*I*wid_mar)	$\frac{((257.000+6)/9)*3.000*0.100}{(2.000*257.000*0.150)}$	85.87	sqm

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: TCS-04 Formula: $((l+6)/9)*l*wc+(nc*l*wid_mar)$	$((1037.000+6)/9)*3.000*0.100)+$ $(2.000*1037.000*0.150)$	345.87	sqm
		Refer: TCS-05 Formula: $((l+6)/9)*l*wc+(nc*l*wid_mar)$	$((2880.000+6)/9)*3.000*0.100)+$ $(2.000*2880.000*0.150)$	960.20	sqm
		Refer: TCS-06 Formula: $((l+6)/9)*l*wc+(nc*l*wid_mar)$	$((227.000+6)/9)*3.000*0.100)+$ $(2.000*227.000*0.150)$	75.87	sqm
		Refer: TCS-07 Formula: $((l+6)/9)*l*wc+(nc*l*wid_mar)$	$((922.000+6)/9)*3.000*0.100)+$ $(2.000*922.000*0.150)$	307.53	sqm
		Refer: TCS-08 Formula: $((l+6)/9)*l*wc+(nc*l*wid_mar)$	$((66.000+6)/9)*3.000*0.100)+$ $(2.000*66.000*0.150)$	22.20	sqm
			Total :	5,644.33	sqm
9	08.15/c/v	Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming to IRC-79 and the drawings.) 120x120 -Road Delineator			
		Refer: Traffic Signs Formula: 2005	2005	2,005.00	each
			Total :	2,005.00	each

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
10	08.18/A/b	Metal Beam Crash Barrier Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 810) For post Height of 1.5 m			
		Refer: Crash Barrier Formula: 3545	3545	3,545.00	Rm
			Total :	3,545.00	Rm
11	08.20/ii	Road Markers/Road stud with lense reflector Providing & fixing of road stud 100x100 mm, die-cast in aluminium , resistance to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973 Light Reflecting Lense Type			
		Refer: Traffic Signs Formula: 9726	9726	9,726.00	nos
			Total :	9,726.00	nos
12	08.22	Lighting on Bridges Providing & fixing lighting on Bridges, mounted on steel hollow circular poles of standard specification, 5 m high fixed on parapets with cement concrete, 20 m apart and fitted with sodium vapour lamp			
		Refer: Traffic Signs Formula: 53	53	53.00	nos
			Total :	53.00	nos

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
13	08/nsc/2	Convex Mirror For Blind Curve			
		Refer: Traffic Signs Formula: 36	36	36.00	nos
			Total :	36.00	nos
14	08/nsc/6	Rumble Strips Provision of 15 nos rumble strips covered with premix bituminous carpet, 15-20 mm high at center, 250 mm wide placed at 1 m center to center at approved locations to control speed, marked with white strips of road marking paint.			
		Refer: Traffic Signs Formula: 580	580	580.00	sqm
			Total :	580.00	sqm
15	16.09	Mild steel railing complete as per drawing and Technical Specifications			
		Refer: Railing Formula: 1092	1092	1,092.00	Rm
			Total :	1,092.00	Rm

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.			
		Refer: Passenger Shelter Formula: $((sw_in*sw_ht*2)+(w_pass*sw_ht*2)+(bw_in*bw_ht)+(l_pass*bw_ht)+(col_l*col_h*6)+(l_pass*roof_w)-(2*win_n*win_l*win_h))*n$	$((1.875*3.830*2)+(2.000*3.830*2)+(5.800*2.350)+(6.000*2.350)+(0.250*2.650*6)+(6.000*1.530)-(2*2.000*1.250*0.900))*6.000$	396.41	sqm
			Total :	396.41	sqm
2	10.16	Cement Plaster 12mm Thick in Cement Morter 1:3			
		Refer: Passenger Shelter Formula: $((sw_in*sw_ht*2)+(w_pass*sw_ht*2)+(bw_in*bw_ht)+(l_pass*bw_ht)+(col_l*col_h*6)+(l_pass*roof_w)-(2*win_n*win_l*win_h))*n$	$((1.875*3.830*2)+(2.000*3.830*2)+(5.800*2.350)+(6.000*2.350)+(0.250*2.650*6)+(6.000*1.530)-(2*2.000*1.250*0.900))*6.000$	396.41	sqm
			Total :	396.41	sqm
3	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m			
		Refer: Passenger Shelter Formula: $((a+0.25*2)*(b+0.25*2)*df*col_n)+((l+2*0.1)*(w+2*0.1)*db))*n$	$((0.750+0.25*2)*(0.750+0.25*2)*0.750*6.000)+((13.500+2*0.1)*(0.500+2*0.1)*0.300))*6.000$	59.45	cum
			Total :	59.45	cum
4	14.01	Brick masonry work in cement mortar 1:3 in foundation complete excluding pointing and plastering, as per drawing and technical specifications			
		Refer: Passenger Shelter Formula: $((l*w*wbtm_thk)+(l*fw_wall*wtop_thk))*n$	$((13.500*0.500*0.150)+(13.500*0.250*0.150))*6.000$	9.11	cum
			Total :	9.11	cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
5	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade			
		Refer: Passenger Shelter Formula: (l_pass-2*w_wall)*(w_pass-2*w_wall) *pcc_thk*n	(6.000-2*0.125)*(2.000-2*0.125) *0.100*6.000	6.04	cum
		Total :	6.04	cum	
6	14.03/e/II	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M25Grade			
		Refer: Passenger Shelter Formula: (((a*b*btm_thk)+(a+col_l)*0.5)*((b+col_w)*0.5)*top_thk)+(col_l*col_w*(df-btm_thk-top_thk))*col_n*n	(((0.750*0.750*0.100)+((0.750+0.250)*0.5)*((0.750+0.250)*0.5)*0.100)+(0.250*0.250*(0.750-0.100-0.100)) *6.000*6.000	4.16	cum
		Total :	4.16	cum	
7	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification			
		Refer: Passenger Shelter Formula: (((a*b*btm_thk)+(a+col_l)*0.5)*((b+col_w)*0.5)*top_thk)+(col_l*col_w*(df-btm_thk-top_thk))*col_n*n)*rf/1000	(((0.750*0.750*0.100)+((0.750+0.250)*0.5)*((0.750+0.250)*0.5)*0.100)+(0.250*0.250*(0.750-0.100-0.100)) *6.000*6.000)*120.000/1000	0.50	MT
		Total :	0.50	MT	
8	14/nsc2	Brick Flat Soling at Foundation			

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: Passenger Shelter Formula: $((l_{pass}-2*w_{wall})*(w_{pass}-2*w_{wall}))+$ $(a*b*col_n)*n$	$((6.000-2*0.125)*(2.000-2*0.125))+$ $(0.750*0.750*6.000))*6.000$	80.63	Sqm
			Total :	80.63	Sqm
9	15.01	Brick masonry work in cement mortar 1:3 in Sub-structure complete excluding pointing and plastering, as per drawing and technical specifications			
		Refer: Passenger Shelter Formula: $((l*w_{wall}*wall_h)+(sw_l*2*w_{wall}*sw_h)$ $+(bw_l*4*w_{wall}*bw_h)+$ $(rail_l*w_{wall}*rail_h))*n-$ $(win_l*w_{wall}*win_h*2*n)$	$((13.500*0.125*0.550)+$ $(1.500*2*0.125*2.130)+$ $(2.650*4*0.125*0.950)+$ $(9.500*0.125*0.450))*6.000-$ $(1.250*0.125*0.900*2*6.000)$	19.43	cum
			Total :	19.43	cum
10	16.01/a/i	cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complete as per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m			
		Refer: Passenger Shelter Formula: $((col_l*col_w*col_h*col_n*0.5)+$ $(col_l*col_w*bcol_h*col_n*0.5)+$ $(sb_l*sb_w*sb_thk*2)+$ $(sb_a*sb_w*sb_thk*4)+$ $(l_{pass}*roof_w*roof_thk)+$ $(l_{pass}*fchj_w*roof_thk)+$ $(l_{pass}*bchj_w*roof_thk)+$ $(bch_l*bch_w*bch_thk))*n$	$((0.250*0.250*2.650*6.000*0.5)+$ $(0.250*0.250*2.100*6.000*0.5)+$ $(1.530*0.250*0.350*2)+$ $(3.000*0.250*0.350*4)+$ $(6.000*1.530*0.110)+$ $(6.000*0.680*0.110)+$ $(6.000*0.450*0.110)+$ $(5.000*0.500*0.075))*6.000$	24.91	cum
			Total :	24.91	cum
11	16.03	HYSD bar reinforcement in super-structure complete as per drawing and technical specifications			

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: Passenger Shelter Formula: $((col_l * col_w * fcol_h * col_n * 0.5) +$ $(col_l * col_w * bcol_h * col_n * 0.5) +$ $(1.530 * 0.250 * 0.350 * 2) +$ $(3.000 * 0.250 * 0.350 * 4) +$ $(sb_l * sb_w * sb_thk * 2) +$ $(sb_a * sb_w * sb_thk * 4) +$ $(l_pass * roof_w * roof_thk) +$ $(l_pass * fchj_w * roof_thk) +$ $(l_pass * bchj_w * roof_thk) +$ $(bch_l * bch_w * bch_thk) * n * srf / 1000$	$((0.250 * 0.250 * 2.650 * 6.000 * 0.5) +$ $(0.250 * 0.250 * 2.100 * 6.000 * 0.5) +$ $(1.530 * 0.250 * 0.350 * 2) +$ $(3.000 * 0.250 * 0.350 * 4) +$ $(6.000 * 1.530 * 0.110) +$ $(6.000 * 0.680 * 0.110) +$ $(6.000 * 0.450 * 0.110) +$ $(5.000 * 0.500 * 0.075) +$ $* 6.000 * 100.000 / 1000$	2.49	MT
			Total :	2.49	MT

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	03.14/Nsc	Construction of Subgrade and Earthen Shoulders Construction of subgrade and earthen shoulders with approved material obtained from Roadway Cutting with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2			
		Refer: Busbay (2 Lane) Formula: (((2*b+a)*(d+f))*n*sg)	$((2*22.000+15.000)*(3.500+2.500))$ $*6.000*0.500$	1,062.00	cum
			Total :	1,062.00	cum
2	04.01/Nsc1	Sub-base with Close Graded Material (Table: - 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material			
		Refer: Busbay (2 Lane) Formula: (((2*b+a)*(d+f))*n*gsb)*(1-gsb_per/100)	$((2*22.000+15.000)*(3.500+2.500))$ $*6.000*0.200*(1-36.600/100)$	269.32	Cum
			Total :	269.32	Cum
3	04/nsc1	Plant Mix Method (material Reuse) Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401			
		Refer: Busbay (2 Lane) Formula: (((2*b+a)*(d+f))*n*gsb)*(gsb_per/100)	$((2*22.000+15.000)*(3.500+2.500))$ $*6.000*0.200*(36.600/100)$	155.48	Cum
			Total :	155.48	Cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
4	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)			
		Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n*(wmm1+wmm2)$	$((2*22.000+15.000)*(3.500+2.500))*6.000*(0.125+0.125)$	531.00	Cum
			Total :	531.00	Cum
5	05.03	Construction of footpath/separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with pre-cast concrete tiles in cement mortar including provision of all drainage arrangements but excluding kerb channel.			
		Refer: Busbay (2 Lane) Formula: $((2*b+a)*f)*n$	$((2*22.000+15.000)*2.500)*6.000$	885.00	sqm
			Total :	885.00	sqm
6	06.01/a	Prime coat (Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer using mechanical means.) A) On WBM/ WMM Surface @ 0.70-1.00 kg/sqm			
		Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n$	$((2*22.000+15.000)*(3.500+2.500))*6.000$	2,124.00	sqm
			Total :	2,124.00	sqm
7	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm			

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n$	$((2*22.000+15.000)*(3.500+2.500))$ $*6.000$	2,124.00	sqm
			Total :	2,124.00	sqm
8	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40			
		Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n*dbm$	$((2*22.000+15.000)*(3.500+2.500))$ $*6.000*0.080$	169.92	cum
			Total :	169.92	cum
9	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40			
		Refer: Busbay (2 Lane) Formula: $((2*b+a)*(d+f))*n*bc$	$((2*22.000+15.000)*(3.500+2.500))$ $*6.000*0.040$	84.96	cum
			Total :	84.96	cum



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m			
		Refer: PCC Chut Drain Formula: (a+2*wall_thk+0.1*2)*f_thk*I	(0.600+2*0.150+0.1*2)*0.100*577.000	63.47	cum
		Refer: RCC Cover Drain 1.0m Formula: (t_width+off*2)*((ht+b_slab_thk)/2)*I	(1.750+0.100*2)*((0.900+0.150)/2)*1377.000	1,409.70	cum
		Refer: RCC Cover Drain 1.75m Formula: (t_width+off*2)*((ht+b_slab_thk)/2)*I	(1.750+0.100*2)*((0.900+0.150)/2)*1092.000	1,117.94	cum
		Refer: RR Masonry Trapezoidal Drain Formula: (a+2*b)*(h+f)*I	(1.000+2*0.200)*(0.850+0.200)*15058.000	22,135.26	cum
		Total :		24,726.37	cum
2	14.02/b	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed)			
		Refer: RR Masonry Trapezoidal Drain Formula: (((0.5*(c+j+2*b)*f)+(((a-j)/2)^2+h^2)^(1/2))*b*2)*I	((0.5*(0.765+0.500+2*0.200)*0.200)+(((1.000-0.500)/2)^2+0.850^2)^(1/2))*0.200*2)*15058.000	7,843.73	cum
		Total :		7,843.73	cum
3	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade			
		Refer: RCC Cover Drain 1.0m Formula: (t_width+off*2)*pcc_thk*I	(1.750+0.100*2)*0.100*1377.000	268.52	cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: RCC Cover Drain 1.75m Formula: (t_width+off*2)*pcc_thk*I	$(1.750+0.100*2)*0.100*1092.000$	212.94	cum
			Total :	481.46	cum
4	14.03/b	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M20 Grade			
		Refer: PCC Chut Drain Formula: (a+2*wall_thk+0.1*2)*f_thk*I	$(0.600+2*0.150+0.1*2)*0.100*577.000$	63.47	cum
			Total :	63.47	cum
5	15.02/b	Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed)			
		Refer: RR Masonry Trapezoidal Drain Formula: (I-(I/5*0.2))*b*d	$(15058.000-(15058.000/5*0.2))*0.200*0.300$	867.34	cum
			Total :	867.34	cum
6	15.03/b/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m			
		Refer: PCC Chut Drain Formula: ((a+wall_thk*2)*btm_thk+ht*wall_thk*2)*I	$((0.600+0.150*2)*0.150+0.400*0.150*2)*577.000$	147.14	cum
			Total :	147.14	cum
7	15.03/f/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height			



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: RCC Cover Drain 1.0m Formula: (ht*w_thk*2+t_width*b_slab_thk+t_width*t_slab_thk)*l	(0.900*0.200*2+1.750*0.150+1.750*0.125)*1377.000	1,158.40	cum
		Refer: RCC Cover Drain 1.75m Formula: (ht*w_thk*2+t_width*b_slab_thk+t_width*t_slab_thk)*l	(0.900*0.200*2+1.750*0.150+1.750*0.125)*1092.000	918.65	cum
			Total :	2,077.05	cum
8	15.05	HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification			
		Refer: RCC Cover Drain 1.0m Formula: (ht*w_thk*2+t_width*b_slab_thk+t_width*t_slab_thk)*l*s	(0.900*0.200*2+1.750*0.150+1.750*0.125)*1377.000*0.050	57.92	MT
		Refer: RCC Cover Drain 1.75m Formula: (ht*w_thk*2+t_width*b_slab_thk+t_width*t_slab_thk)*l*s	(0.900*0.200*2+1.750*0.150+1.750*0.125)*1092.000*0.050	45.93	MT
			Total :	103.85	MT
9	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications			
		Refer: RCC Cover Drain 1.0m Formula: (l/2+1)	(1377.000/2+1)	689.50	Rm
		Refer: RCC Cover Drain 1.75m Formula: (l/2+1)	(1092.000/2+1)	547.00	Rm
			Total :	1,236.50	Rm
10	24/i/b	Galvanised Mild steel J /L hook			

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
		Refer: RCC Cover Drain 1.0m Formula: $l/15*4*.3$	$1377.000/15*4*.3$	110.16	kg
		Refer: RCC Cover Drain 1.75m Formula: $l/15*4*.3$	$1092.000/15*4*.3$	87.36	kg
			Total :	197.52	kg
11	40	Gextextile material (fine net)			
		Refer: RCC Cover Drain 1.0m Formula: $(l/1)*4*(150*150/1000^2)$	$(1377.000/1)*4*(150*150/1000^2)$	123.93	sqm
		Refer: RCC Cover Drain 1.75m Formula: $(l/1)*4*(150*150/1000^2)$	$(1092.000/1)*4*(150*150/1000^2)$	98.28	sqm
			Total :	222.21	sqm

Quantity Backup Calculation For Bill : 10. Retaining wall

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m			
		Refer: Retaining Wall 2.0m Formula: (((0.5*((pcc_thk+H2+d)+(pcc_thk+d))* (B1+2*o))+((H2+d)*(mw-o)))*l)*(1-p_c)	(((0.5*((0.300+0.211+0.600)+ (0.300+0.600))*(1.270+2*0.150))+ ((0.211+0.600)*(0.600-0.150))) *1103.000)*(1-0.200)	1,715.02	cum
			Total :	1,715.02	cum
2	13.01/b/ii	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to			
		Refer: Retaining Wall 2.0m Formula: (((0.5*((pcc_thk+H2+d)+(pcc_thk+d))* (B1+2*o))+((H2+d)*(mw-o)))*l)*p_c	(((0.5*((0.300+0.211+0.600)+ (0.300+0.600))*(1.270+2*0.150))+ ((0.211+0.600)*(0.600-0.150))) *1103.000)*0.200	428.76	cum
			Total :	428.76	cum
3	13.04	Filter medium behind abutment,wing wall and return wall complete as per drawing and technical specification .			
		Refer: Retaining Wall 2.0m Formula: mw*(H2+H1)*l	0.600*(0.211+2.000)*1103.000	1,463.24	cum
			Total :	1,463.24	cum
4	14.02/b	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed)			
		Refer: Retaining Wall 2.0m Formula: ((0.5*(B1+e)*d)+(0.5*B1*H2))*l	(((0.5*(1.270+1.067)*0.600)+ (0.5*1.270*0.211))*1103.000	921.10	cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
			Total :	921.10	cum
5	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade			
		Refer: Retaining Wall 2.0m Formula: (B2+2*o)*pcc_thk*I	(1.284+2*0.150)*0.300*1103.000	524.15	cum
			Total :	524.15	cum
6	15.02/b	Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed)			
		Refer: Retaining Wall 2.0m Formula: (0.5*(T+e)*(H1-d))*I	(0.5*(0.600+1.067)*(2.000-0.600))*1103.000	1,287.09	cum
			Total :	1,287.09	cum
7	15.03/b/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade Upto 5m			
		Refer: Retaining Wall 2.0m Formula: (l-(l/10*gap))*para_ht*para_w	(1103.000-(1103.000/10*0.300))*0.450*0.300	144.44	cum
			Total :	144.44	cum
8	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications			
		Refer: Retaining Wall 2.0m Formula: n*I	2.000*1103.000	2,206.00	Rm



Quantity Backup Calculation For Bill : 10. Retaining wall

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
			Total :	2,206.00	Rm



SI No	SOR Ref No	Description	Calculation	Quantity	Unit
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m			
		Refer: Breast Wall 2.0m Ht Formula: $(h+2*0.5)*(e+f)*(1-p)*l$	$(1.890+2*0.5)*(0.850+0.300)*(1-0.200)*3802.000$	10,108.76	cum
			Total :	10,108.76	cum
2	13.01/b/ii	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary rock if blasting is not resorted to			
		Refer: Breast Wall 2.0m Ht Formula: $(h+2*0.5)*(e+f)*p*l$	$(1.890+2*0.5)*(0.850+0.300)*0.200*3802.000$	2,527.19	cum
			Total :	2,527.19	cum
3	13.03/a	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials			
		Refer: Breast Wall 2.0m Ht Formula: $c*b*l$	$1.550*0.300*3802.000$	1,767.93	cum
			Total :	1,767.93	cum
4	13.03/b	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material			
		Refer: Breast Wall 2.0m Ht Formula: $d*b*l$	$0.450*0.300*3802.000$	513.27	cum
			Total :	513.27	cum

SI No	SOR Ref No	Description	Calculation	Quantity	Unit
5	14.02/b	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed)			
		Refer: Breast Wall 2.0m Ht Formula: $0.5*(e+(e-(h/5)))*h*I$	$0.5*(0.850+(0.850-(1.890/5)))$ $*1.890*3802.000$	4,749.80	cum
			Total :	4,749.80	cum
6	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade			
		Refer: Breast Wall 2.0m Ht Formula: $g*f*I$	$1.933*0.300*3802.000$	2,204.78	cum
			Total :	2,204.78	cum
7	15.02/b	Stone masonry work in cement mortar 1:3 in Sub-structure complete as drawing and Technical Specification R a n d o m R u b b l e M a s o n r y (coursed/uncoursed)			
		Refer: Breast Wall 2.0m Ht Formula: $(0.5*((a+(c+d)/3)+a)*(d+c)+i*d+i*m)*I$	$(0.5*((0.600+(1.550+0.450)/3)+0.600)*$ $(0.450+1.550)$ $+0.100*0.450+0.100*0.000)*3802.000$	7,268.16	cum
			Total :	7,268.16	cum
8	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications			
		Refer: Breast Wall 2.0m Ht Formula: $(l/1.2)*(h-j-i)$	$(3802.000/1.2)*(1.890-0.600-0.100)$	3,770.32	Rm
			Total :	3,770.32	Rm

**BILL OF QUANTITY
(STRUCTURE PART)**



Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
Foundation						
1	10.20	Plain cement concrete M-15 mix with stone aggregate 20mm. Nominal size mechanically mixed and vibrated in foundation depth of 1.5m. below ground / bed level and or 1.5m. above ground/bed level i/c formwork.	cum	1,454.00		
2	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	10,984.00		
Sub Total of			Foundation			
Sub Structure						
3	10.06/a	Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Sub-Structure	Ton	661.00		
4	10.20/b	Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting b)Selected Granular Material in Filling	cum	4,189.00		
5	10.20/c	Providing and filling in foundation trenches and at the back of abutments, wing walls etc. and below pipe bed in layers not exceeding 150mm thick including watering and compacting c)Filler Media behind abutment ,wing and return wall	cum	5,864.00		
6	15.03/f/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M25 Grade upto 5m height	cum	8,261.00		
7	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications				



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Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			Rm	2,821.00		
Sub Total of			Sub Structure			
Super Structure						
8	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm	sqm	2,139.00		
9	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5% of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	86.00		
10	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	1,100.00		
11	08/nsc/5	Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified				



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Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			m	430.00		
12	10.06/b	Steel reinforcement for R.C.C. works including bending, binding and placing in position. A) for Super-Structure	Ton	96.00		
13	16.01/a/i	cement concrete Reinforced concrete in super-structure as per drawing and Technical Specification i/c form work complete as per drawing and technical specification RCC Grade M25 For solid slab super-structure Upto 5m Upto 5m	cum	1,194.00		
14	16.11	Drainage Spouts complete as per drawing and Technical specification	each	134.00		
15	16.17	Mastic asphalt (providing and laying 12mm thick mastic asphalt wearing courses on top of deck slab excluding prime coat with paving grade bitumen meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen pre-coated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10cm centre in both direction, pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface, all complete as per clause 515) using Bitumen VG-40 (3/40)	sqm	2,139.00		
Sub Total of			Super Structure			
Protection Work						
16	10.19	Dry Boulder pitching	cum	563.00		
17	13.01/a/i /Nsc	Earth work in excavation Ordinary soil For Protection Work	cum	3,357.00		



Bill No : 12. Culvert

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
18	16/nsc	For Protection Work - cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade upto 5m height	cum	1,851.00		
Sub Total of			Protection Work			
Miscellaneous Work						
19	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	1,100.00		
Sub Total of			Miscellaneous Work			
Total of Bill						12. Culvert



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Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
Foundation						
1	13.01/a/i	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth upto 3 m	cum	2,306.05		
2	13.01/a/ii	Earth work in excavation of foundation for structures as per drawing and technical specification Ordinary soil Depth 3 m to 6 m	cum	267.00		
3	14.03/a	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications PCC M15 Grade	cum	104.00		
4	14.03/g	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications RCC M30 Grade	cum	334.00		
5	14.08	HYSD bar reinforcement in foundation complete as per drawing and technical specification	MT	40.00		
Sub Total of			Foundation			
Sub Structure						
6	13.03/a	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Granular materials	cum	132.00		
7	13.03/b	Backfilling abutment, wing wall and Return walls complete as per drawing and technical specification Good Sandy Soil free from organic material	cum	2,891.00		
8	13.04	Filter medium behind abutment, wing wall and return wall complete as per drawing and technical specification .	cum	404.00		



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
9	15.03/g/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M30 Grade upto 5m height	cum	534.00		
10	15.03/h/i	cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification RCC M35 Grade Pedestal	cum	26.00		
11	15.05	HYSD bar reinforcement in Sub-structure complete as per drawing and technical specification	MT	75.00		
12	15.12	Providing weep holes in concrete/Reinforced concrete abutment, wing wall/return wall Complete as per drawing and Technical specifications	Rm	598.00		
Sub Total of			Sub Structure			
Super Structure						
13	06.02/i	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor m on the prepared bituminous/ granular surface cleaned with mechanical broom. i) On bituminous Surface @ 0.20 - 0.30 kg/sqm	sqm	408.00		



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
14	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5% of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	60.00		
15	14/nsc1/i	Filler joint i)Providing & fixing 2 mm thick corrugated copper plate in expansion joint complete as per drawing & Technical Specification.	m	48.00		
16	14/nsc1/i	Filler joint Providing & fixing 20 mm thick compressible fibre board in expansion joint complete as per drawing & Technical Specification.	m	48.00		
17	14/nsc1/i	Filler joint iii)Providing and fixing in position 20 mm thick premoulded joint filler in expansion joint for fixed ends of simply supported spans not exceeding 10 m to cater for a horizontal movement upto 20 mm, covered with sealant complete as per drawing and technical specifications.	m	48.00		
18	14/nsc1/i	Filler joint iv)Providing and filling joint sealing compound as per drawings and technical specifications with coarse sand and 6 per cent bitumen by weight.	m	48.00		
19	16.01/b/i /c2/ii	RCC Grade M30 For solid slab super-structure Approach Slab	cum	226.00		



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
20	16.03	HYSB bar reinforcement in super-structure complete as per drawing and technical specifications	MT	41.00		
21	16.05	Cement concrete wearing coat M-30 grade including reinforcement complete as per drawing and Technical Specifications	cum	3.00		
22	16.08	Reinforced concrete railing of M30 Grade complete as per approved drawings and technical specification	Rm	74.00		
23	16.11	Drainage Spouts complete as per drawing and Technical specification	each	8.00		
24	16.12/Ns	Reinforced cement concrete approach slab M-30 including reinforcement and formwork complete as per drawing and Technical specification	cum	58.00		
25	16.13	PCC M15 ordinary Grade leveling course below approach slab complete as per drawing and Technical specification Below Approach Slab	cum	22.00		
26	16.17	Mastic asphalt (providing and laying 12mm thick mastic asphalt wearing courses on top of deck slab excluding prime coat with paving grade bitumen meeting the requirement given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10cm centre in both direction, pressed into surface not less than 100 deg. C. protruding 1mm to 4mm over mastic surface, all complete as per clause 515) using Bitumen VG-40 (3/40)	sqm	408.00		
Sub Total of			Super Structure			
Protection Work						



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
27	08/nsc/5	Reinforced Cement Concrete Crash Barrier-Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-40 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	m	74.00		
28	16/nsc	For Protection Work - cement concrete for Plain/Reinforced concrete in open foundation complete as per drawing and technical specifications i/c work complete as per drawing and technical specification PCC M20 Grade upto 5m height	cum	41.00		
29	17.01/a	laying apron complete as per drawing and Technical specification. Boulder	cum	59.00		
30	17.02	Filter material underneath pitching in slopes complete as per drawing and Technical specification	cum	30.00		
31	17.03/a	Pitching on slopes complete as per drawing and Technical specifications Stone	cum	61.00		
Sub Total of						
Protection Work						
Miscellaneous Work						
32	02.04/i/c	Dismantling upto 1.5m in foundation and/or 1.5m above ground level including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of un-serviceable materials and stacking the serviceable materials within a lead of 100m. c)Pre- stressed/ Reinforced Cement Concrete grade M20 & above				



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Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
			cum	1,199.00		
33	08.05	Painting two coat after filling the surface with synthetic enamel paint in all shades on new plastered concrete surface.	sqm	508.00		
34	08.12	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign as per IRC:67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing)	sqm	4.00		
35	13/nsc1	Confirmatory Boring in Soil	cum	12.00		
36	13/nsc2	Confirmatory Boring in Hard Rock	cum	20.00		
Sub Total of			Miscellaneous Work			
Diversion Work						
37	03.13	Construction of Embankment with Material Deposited from Roadway Cutting Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-2	cum	6,400.00		
38	03.31	Excavation in Hill Area in Soil by Mechanical Means Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres	cum	7,200.00		



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Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
39	04.01/Nsc1	Sub-base with Close Graded Material (Table:- 400-1) Plant Mix Method Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401 For Grading- V Material	Cum	360.00		
40	05.02	Wet Mix Macadam (Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.)	Cum	600.00		
41	06/Nsc1	Providing and laying dense bituminous macadam with 40-60 TPH batch type HMP producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 4.25 % by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects. B) GradingII(19 mm nominal size) iii)Using bitumen 30/40	cum	120.00		



Bill No : 13. Minor Bridge

SI No	SOR Ref No	Description	Unit	Quantity	Rate(Rs)	Cost(Rs)
42	06/Nsc2	Providing and laying bituminous concrete with 40-600 TPH batch type hot mix plant producing an average output of 35 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.5% of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects B) Grading-II (13 mm nominal size) iii)Using bitumen 30/40	cum	60.00		
43	09.01/nsc 1	Laying Reinforced Cement Concrete Pipe NP4 / Prestressed Concrete Pipe on First Class Bedding in Single Row . B)1200 mm dia	Rm	60.00		
Sub Total of Diversion Work						
Total of Bill 13. Minor Bridge						



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QUANTITY CALCULATION (STRUCTURE PART)



SUMMARY FOR BOX CULVERT			TYPE-1 2.0X2.0m_TW- 10_Catchpit with stepped_NC	TYPE-2 2.0X2.0m_TW- 10_Catchpit with stepped_SE-6.7%	TYPE-3 2.0X2.0m_TW- 11_Catchpit with stepped_NC	TYPE-4 2.0X2.0m_TW- 11_Catchpit with stepped_SE-4%	TYPE-5 2.0X2.0m_TW- 11_Catchpit with stepped_SE-5.7%	TYPE-6 2.0X2.0m_TW- 11_Catchpit with stepped_SE-5.9%
SI No.	Description	Unit	1	1	12	1	1	1
1	Excavation	cum	82.56	101.05	86.38	90.68	104.35	93.16
2	PCC-M15	cum	11.01	14.39	11.55	12.63	14.82	12.97
3	RCC-Substructure	cum	45.52	60.46	48.11	51.75	62.70	55.40
4	Steel	ton	3.64	4.84	3.85	4.14	5.02	4.43
5	Weep holes	nos	18.00	33.00	18.00	16.00	22.00	22.00
6	Filter media	cum	36.65	47.71	38.69	38.67	49.44	49.84
7	Sand Filling in Foundation Trenches	cum	36.14	42.49	37.27	39.12	43.44	40.04
8	RCC-Superstructure(up to 5m)	cum	10.79	9.33	12.05	7.93	10.26	10.26
9	Steel	ton	0.86	0.75	0.96	0.63	0.82	0.82
10	Bituminous Concrete	cum	0.94	0.94	1.04	0.78	1.04	1.04
11	Mastic Asphalt	sqm	23.40	23.40	26.00	19.50	26.00	26.00
12	Tack Coat	sqm	23.40	23.40	26.00	19.50	26.00	26.00
13	RCC M-40 Crash Barrier	m	5.20	5.20	5.20	5.20	5.20	5.20
14	Drainage Spout	nos	2.00	2.00	2.00	2.00	2.00	2.00
16	Curtain Wall PCC M-20	cum	12.55	12.55	12.55	12.55	12.55	12.55
17	Excavation in Soil	cum	43.85	43.85	43.85	43.85	43.85	43.85
18	PCC M-15 Below Curtain Wall	cum	11.64	11.64	11.64	11.64	11.64	11.64
19	300 mm Boulder Pitching	cum	7.00	7.00	7.00	7.00	7.00	7.00
20	Painting	sqm	13.30	13.30	13.30	13.30	13.30	13.30



SUMMARY FOR BOX CULVERT			TYPE-7 2.0X2.0m_TW- 11_Catchpit with stepped_SE-7%	TYPE-8 2.0X2.0m_TW- 12_Catchpit with stepped_NC	TYPE-9 2.0X3.0m_TW- 10_Catchpit with stepped_NC	TYPE-10 2.0X3.0m_TW- 11_Catchpit with stepped_NC	TYPE-11 2.0X3.0m_TW- 11_Catchpit with stepped_SE-5.9%	TYPE-12 2.0X3.0m_TW- 11_Catchpit with stepped_SE-7%
Span(m) x Height(m)=			4	2	2	12	1	4
SI No.	Description	Unit						
1	Excavation	cum	94.47	90.20	123.82	126.56	156.64	159.09
2	PCC-M15	cum	13.25	12.09	17.17	17.57	21.83	22.27
3	RCC-Substructure	cum	56.84	50.70	85.79	87.96	114.34	117.13
4	Steel	ton	4.55	4.06	6.86	7.04	9.15	9.37
5	Weep holes	nos	33.00	20.00	33.00	33.00	33.00	52.00
6	Filter media	cum	52.10	40.73	69.21	70.83	85.19	88.05
7	Sand Filling in Foundation Trenches	cum	40.57	38.40	50.78	51.60	61.09	61.87
8	RCC-Superstructure(up to 5m)	cum	10.26	13.34	14.43	13.09	11.24	11.24
9	Steel	ton	0.82	1.07	1.15	1.05	0.90	0.90
10	Bituminous Concrete	cum	1.04	1.14	1.03	1.08	1.08	1.08
11	Mastic Asphalt	sqm	26.00	28.60	25.65	27.00	27.00	27.00
12	Tack Coat	sqm	26.00	28.60	25.65	27.00	27.00	27.00
13	RCC M-40 Crash Barrier	m	5.20	5.20	5.40	5.40	5.40	5.40
14	Drainage Spout	nos	2.00	2.00	2.00	2.00	2.00	2.00
16	Curtain Wall PCC M-20	cum	12.55	12.55	12.55	12.55	12.55	12.55
17	Excavation in Soil	cum	43.85	43.85	43.85	43.85	43.85	43.85
18	PCC M-15 Below Curtain Wall	cum	11.64	11.64	11.64	11.64	11.64	11.64
19	300 mm Boulder Pitching	cum	7.00	7.00	7.00	7.00	7.00	7.00
20	Painting	sqm	13.30	13.30	13.81	13.81	13.81	13.81



SUMMARY FOR BOX CULVERT		Span(m) x Height(m)=	TYPE-13	TYPE-14	TYPE-15	TYPE-16	TYPE-17	TYPE-18
SI No.	Description		Unit	2.0X3.0m_TW- 12_Catchpit with stepped_NC	3.0X3.0m_TW- 11_Catchpit with stepped_NC	3.0X4.0m_TW- 10_Catchpit with stepped_NC	3.0X4.0m_TW- 11_Catchpit with stepped_NC	3.0X4.0m_TW- 11_Catchpit with stepped_SE-7%	3.0X4.0m_TW- 12_Catchpit with stepped_NC
			1	3	1	9	5	1
1	Excavation	cum	132.05	135.86	183.72	191.46	211.41	199.20
2	PCC-M15	cum	18.37	19.16	25.15	26.24	28.82	27.34
3	RCC-Substructure	cum	92.31	96.24	150.34	157.56	184.70	164.77
4	Steel	ton	7.38	7.70	12.03	12.60	14.78	13.18
5	Weep holes	nos	36.00	33.00	52.00	52.00	65.00	56.00
6	Filter media	cum	74.07	72.28	108.07	112.51	130.20	116.95
7	Sand Filling in Foundation Trenches	cum	53.25	51.32	66.61	68.56	74.62	70.51
8	RCC-Superstructure(up to 5m)	cum	14.49	20.63	20.07	22.35	18.76	24.67
9	Steel	ton	1.16	1.65	1.61	1.79	1.50	1.97
10	Bituminous Concrete	cum	1.19	1.54	1.41	1.57	1.49	1.72
11	Mastic Asphalt	sqm	29.70	38.40	35.28	39.20	37.24	43.12
12	Tack Coat	sqm	29.70	38.40	35.28	39.20	37.24	43.12
13	RCC M-40 Crash Barrier	m	5.40	7.68	7.84	7.84	7.84	7.84
14	Drainage Spout	nos	2.00	2.00	2.00	2.00	2.00	2.00
16	Curtain Wall PCC M-20	cum	12.55	13.91	13.91	13.91	13.91	13.91
17	Excavation in Soil	cum	43.85	50.80	50.80	50.80	50.80	50.80
18	PCC M-15 Below Curtain Wall	cum	11.64	14.22	14.22	14.22	14.22	14.22
19	300 mm Boulder Pitching	cum	7.00	8.96	8.96	8.96	8.96	8.96
20	Painting	sqm	13.81	19.65	20.05	20.05	20.05	20.05



SUMMARY FOR BOX CULVERT			TYPE-19 3.0X4.0m_TW- 11_Catchpit with stepped_NC_EC	TYPE-20 3.0X4.0m_TW- 11_Catchpit with stepped_SE- 7%_EC	TYPE-21 4.0X3.0m_TW- 11_Catchpit with stepped_SE-7%	TYPE-22 4.0X5.0m_TW- 11_Catchpit with stepped_NC	TYPE-23 4.0X5.0m_TW- 11_Catchpit with stepped_SE-6.7%	TYPE-24 4.0X5.0m_TW- 11_Catchpit with stepped_SE-7%
SI No.	Description	Unit	1	1	1	1	1	3
1	Excavation	cum	184.19	311.01	335.19	336.15	196.24	342.91
2	PCC-M15	cum	25.76	37.26	40.60	40.73	26.07	35.75
3	RCC-Substructure	cum	143.83	300.61	334.36	335.78	149.94	258.84
4	Steel	ton	11.51	24.05	26.75	26.86	12.00	20.71
5	Weep holes	nos	52.00	75.00	90.00	90.00	36.00	60.00
6	Filter media	cum	90.59	162.14	186.42	187.48	77.43	149.04
7	Sand Filling in Foundation Trenches	cum	60.37	94.03	100.25	100.50	57.91	137.59
8	RCC-Superstructure(up to 5m)	cum	25.00	33.95	30.33	30.33	42.18	29.58
9	Steel	ton	2.00	2.72	2.43	2.43	3.37	2.37
10	Bituminous Concrete	cum	2.00	2.10	2.10	2.10	2.70	
11	Mastic Asphalt	sqm	50.00	52.60	52.60	52.60	67.54	
12	Tack Coat	sqm	50.00	52.60	52.60	52.60	67.54	
13	RCC M-40 Crash Barrier	m	10.00	10.52	10.52	10.52	12.28	
14	Drainage Spout	nos	2.00	2.00	2.00	2.00	2.00	
16	Curtain Wall PCC M-20	cum	15.27	15.27	15.27	15.27	16.64	13.91
17	Excavation in Soil	cum	57.74	57.74	57.74	57.74	64.68	52.56
18	PCC M-15 Below Curtain Wall	cum	16.80	16.80	16.80	16.80	19.39	14.22
19	300 mm Boulder Pitching	cum	10.93	10.93	10.93	10.93	12.89	8.96
20	Painting	sqm	25.58	26.91	26.91	26.91	31.41	



SUMMARY FOR BOX CULVERT			Span(m) x Height(m)=	TYPE-25 5.0X3.0m_TW- 12_Catchpit with stepped_NC	Total
			1	71	
Sl No.	Description	Unit			
1	Excavation	cum	263.70	10984.01	
2	PCC-M15	cum	29.88	1453.882	
3	RCC-Substructure	cum	190.77	8261.28	
4	Steel	ton	15.26	660.9024	
5	Weep holes	nos	60.00	2821	
6	Filter media	cum	130.66	5863.599	
7	Sand Filling in Foundation Trenches	cum	111.54	4188.78	
8	RCC-Superstructure(up to 5m)	cum	24.36	1193.861	
9	Steel	ton	1.95	95.50891	
10	Bituminous Concrete	cum		85.5776	
11	Mastic Asphalt	sqm		2139.44	
12	Tack Coat	sqm		2139.44	
13	RCC M-40 Crash Barrier	m		429.92	
14	Drainage Spout	nos		134	
16	Curtain Wall PCC M-20	cum	13.91	937.27	
17	Excavation in Soil	cum	52.56	3356.691	
18	PCC M-15 Below Curtain Wall	cum	14.22	914.0787	
19	300 mm Boulder Pitching	cum	8.96	563.4855	
20	Painting	sqm		1099.735	



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =10 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	4.600	11.000	0.830	42.00
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum	4	3.510	3.500	0.550	27.03
						Total	82.56

2	PCC-M15						
	Box culvert	cum	1	3.600	7.760	0.150	4.19
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	4	3.110	2.700	0.150	5.04
						Total	11.01

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	10.000	0.380	13.68
	Box Side Wall	cum	2	10.00	2.000	0.300	12.00
	Base slab of Return wall II	cum	4	3.010	2.500	0.250	7.53
	Return wall I	cum	4	0.500	2.350	0.250	1.18
	Return wall II	cum	4	3.010	0.225	2.480	6.72
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	45.52

4	Steel						
	@ 80 Kg per cum of concrete	ton					3.64
						Total	3.64

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $9.5/2 =$					5	
	No of weep holes in vertical direction per abutment = $1.7/1 =$					2	
	No of weep holes in horizontal direction per return wall = $3/2 =$					2	
	No of weep holes in vertical direction per return wall = $1.7/1 =$					2	
	Total no of Weep holes per abutment = 5×2					10	
Total no of Weep holes per return wall = 2×2					4		
						Total	18.00

6	Filter media						
	Behind Abutment	cum	2	9.500	0.600	1.700	19.38
	Behind Return Wall	cum	4	3.510	0.600	2.050	17.27
						Total	36.65

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					82.56
	Less for PCC	cum					11.01
	Less for Bottom Slab RCC	cum					13.68
	Less for Shear Key RCC	cum					4.19
	Less for Return Wall-I RCC	cum	4	0.500	0.250	0.300	0.15
	Less for Return Wall-II Base Slab	cum					7.53
	Less for Return Wall-II Stem Wall	cum	4	3.010	0.250	0.430	1.29
Less for Box above Invert upto EGL	cum	1	2.60	11.000	0.300	8.58	
						Total	36.14

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	10.000	0.406	10.56
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	10.79



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =10 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					0.86
						Total	0.86
10	Bituminous Concrete						
		cum	1	2.60	9.00	0.04	0.94
						Total	0.94
11	Mastic Asphalt						
		sqm	1	2.60	9.00		23.40
						Total	23.40
12	Tack Coat						
		sqm	1	2.60	9.00		23.40
						Total	23.40
13	RCC M-40 Crash Barrier	m	2	2.60			5.20
						Total	5.20
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =10 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.60	2.558		13.30
						Total	13.30



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =10 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	4.600	11.000	0.830	42.00
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum	4	4.410	4.300	0.600	45.51
						Total	101.05

2	PCC-M15						
	Box culvert	cum	1	3.600	7.760	0.150	4.19
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	4	4.010	3.500	0.150	8.42
						Total	14.39

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	10.000	0.380	13.68
	Box Side Wall	cum	2	10.00	2.302	0.300	13.81
	Base slab of Return wall II	cum	4	3.910	3.300	0.300	15.48
	Return wall I	cum	4	0.500	2.652	0.250	1.33
	Return wall II	cum	4	3.910	0.275	2.732	11.75
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	60.46

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.84
						Total	4.84

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $9.5/2 =$						5
	No of weep holes in vertical direction per abutment = $2/1 =$						3
	No of weep holes in horizontal direction per return wall = $3/2 =$						3
	No of weep holes in vertical direction per return wall = $2/1 =$						3
	Total no of Weep holes per abutment = 5×3						15
	Total no of Weep holes per return wall = 3×3						9
	Total mtrs of weep holes = $15 \times 2 + 9 \times 4$					Total	33.00

6	Filter media						
	Behind Abutment	cum	2	9.500	0.600	2.002	22.82
	Behind Return Wall	cum	4	4.410	0.600	2.352	24.89
						Total	47.71

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					101.05
	Less for PCC	cum					14.39
	Less for Bottom Slab RCC	cum					13.68
	Less for Shear Key RCC	cum					4.19
	Less for Return Wall-I RCC	cum	4	0.500	0.250	0.300	0.15
	Less for Return Wall-II Base Slab	cum					15.48
	Less for Return Wall-II Stem Wall	cum	4	3.910	0.350	0.380	2.08
	Less for Box above Invert upto EGL	cum	1	2.60	11.000	0.300	8.58
						Total	42.49

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	10.000	0.350	9.10
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	9.33



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =10 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					0.75
						Total	0.75
10	Bituminous Concrete						
		cum	1	2.60	9.00	0.04	0.94
						Total	0.94
11	Mastic Asphalt						
		sqm	1	2.60	9.00		23.40
						Total	23.40
12	Tack Coat						
		sqm	1	2.60	9.00		23.40
						Total	23.40
13	RCC M-40 Crash Barrier	m	2	2.60			5.20
						Total	5.20
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallel to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =10 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.60	2.558		13.30
						Total	13.30



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	4.600	12.000	0.830	45.82
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum	4	3.510	3.500	0.550	27.03
						Total	86.38

2	PCC-M15						
	Box culvert	cum	1	3.600	8.760	0.150	4.73
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	4	3.110	2.700	0.150	5.04
						Total	11.55

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	11.000	0.380	15.05
	Box Side Wall	cum	2	11.00	2.000	0.300	13.20
	Base slab of Return wall II	cum	4	3.010	2.500	0.250	7.53
	Return wall I	cum	4	0.500	2.350	0.250	1.18
	Return wall II	cum	4	3.010	0.225	2.480	6.72
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	48.11

4	Steel						
	@ 80 Kg per cum of concrete	ton					3.85
						Total	3.85

5	Weep holes						
	Spacing for weep holes = 2 m. in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.5/2 =$						5
	No of weep holes in vertical direction per abutment = $1.7/1 =$						2
	No of weep holes in horizontal direction per return wall = $3/2 =$						2
	No of weep holes in vertical direction per return wall = $1.7/1 =$						2
	Total no of Weep holes per abutment = 5×2						10
Total no of Weep holes per return wall = 2×2						4	
						Total	18.00

6	Filter media						
	Behind Abutment	cum	2	10.500	0.600	1.700	21.42
	Behind Return Wall	cum	4	3.510	0.600	2.050	17.27
						Total	38.69

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					86.38
	Less for PCC	cum					11.55
	Less for Bottom Slab RCC	cum					15.05
	Less for Shear Key RCC	cum					4.19
	Less for Return Wall-I RCC	cum	4	0.500	0.250	0.300	0.15
	Less for Return Wall-II Base Slab	cum					7.53
	Less for Return Wall-II Stem Wall	cum	4	3.010	0.250	0.430	1.29
Less for Box above Invert upto EGL	cum	1	2.60	12.000	0.300	9.36	
						Total	37.27

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	11.000	0.413	11.80
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	12.05



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					0.96
						Total	0.96
10	Bituminous Concrete						
		cum	1	2.60	10.00	0.04	1.04
						Total	1.04
11	Mastic Asphalt						
		sqm	1	2.60	10.00		26.00
						Total	26.00
12	Tack Coat						
		sqm	1	2.60	10.00		26.00
						Total	26.00
13	RCC M-40 Crash Barrier	m	2	2.60			5.20
						Total	5.20
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.60	2.558		13.30
						Total	13.30



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =8.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	4.600	9.500	0.830	36.27
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum	4	3.960	4.300	0.600	40.87
						Total	90.68

2	PCC-M15						
	Box culvert	cum	1	3.600	6.260	0.150	3.38
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	4	3.560	3.500	0.150	7.48
						Total	12.63

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	8.500	0.380	11.63
	Box Side Wall	cum	2	8.50	2.150	0.300	10.97
	Base slab of Return wall II	cum	4	3.460	3.300	0.300	13.70
	Return wall I	cum	4	0.500	2.500	0.250	1.25
	Return wall II	cum	4	3.460	0.275	2.580	9.82
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	8.500	0.01125		0.19
						Total=	51.75

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.14
						Total	4.14

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment =8/2 =						4
	No of weep holes in vertical direction per abutment =1.9/1 =						2
	No of weep holes in horizontal direction per return wall =3/2 =						2
	No of weep holes in vertical direction per return wall =1.9/1 =						2
	Total no of Weep holes per abutment = 4 x 2						8
	Total no of Weep holes per return wall = 2 x 2						4
	Total mtrs of weep holes = 8 x 2 + 4 x 4					Total	16.00

6	Filter media						
	Behind Abutment	cum	2	8.000	0.600	1.850	17.76
	Behind Return Wall	cum	4	3.960	0.600	2.200	20.91
						Total	38.67

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					90.68
	Less for PCC	cum					12.63
	Less for Bottom Slab RCC	cum					11.63
	Less for Shear Key RCC	cum					4.19
	Less for Return Wall-I RCC	cum	4	0.500	0.250	0.300	0.15
	Less for Return Wall-II Base Slab	cum					13.70
	Less for Return Wall-II Stem Wall	cum	4	3.460	0.350	0.380	1.84
	Less for Box above Invert upto EGL	cum	1	2.60	9.500	0.300	7.41
						Total	39.12

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	8.500	0.350	7.74
	(+)Haunch	cum	2	8.50	0.01125		0.19
						Total	7.93



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =8.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					0.63
						Total	0.63
10	Bituminous Concrete						
		cum	1	2.60	7.50	0.04	0.78
						Total	0.78
11	Mastic Asphalt						
		sqm	1	2.60	7.50		19.50
						Total	19.50
12	Tack Coat						
		sqm	1	2.60	7.50		19.50
						Total	19.50
13	RCC M-40 Crash Barrier	m	2	2.60			5.20
						Total	5.20
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallel to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =8.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014		3.320	16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427		1.003	7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.60		2.558	13.30
						Total	13.30



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	4.600	12.000	0.830	45.82
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum	4	4.360	4.300	0.600	45.00
	Total						104.35

2	PCC-M15						
	Box culvert	cum	1	3.600	8.760	0.150	4.73
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	4	3.960	3.500	0.150	8.32
	Total						14.82

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	11.000	0.380	15.05
	Box Side Wall	cum	2	11.00	2.285	0.300	15.08
	Base slab of Return wall II	cum	4	3.860	3.300	0.300	15.29
	Return wall I	cum	4	0.500	2.635	0.250	1.32
	Return wall II	cum	4	3.860	0.275	2.715	11.53
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	11.000	0.01125		0.25
		Total=					

4	Steel						
	@ 80 Kg per cum of concrete	ton					5.02
	Total						5.02

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.5/2 =$						5
	No of weep holes in vertical direction per abutment = $2/1 =$						2
	No of weep holes in horizontal direction per return wall = $3/2 =$						3
	No of weep holes in vertical direction per return wall = $2/1 =$						2
	Total no of Weep holes per abutment = 5×2						10
	Total no of Weep holes per return wall = 3×2						6
	Total						22.00

6	Filter media						
	Behind Abutment	cum	2	10.500	0.600	1.985	25.01
	Behind Return Wall	cum	4	4.360	0.600	2.335	24.43
	Total						49.44

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					104.35
	Less for PCC	cum					14.82
	Less for Bottom Slab RCC	cum					15.05
	Less for Shear Key RCC	cum					4.19
	Less for Return Wall-I RCC	cum	4	0.500	0.250	0.300	0.15
	Less for Return Wall-II Base Slab	cum					15.29
	Less for Return Wall-II Stem Wall	cum	4	3.860	0.350	0.380	2.05
Less for Box above Invert upto EGL	cum	1	2.60	12.000	0.300	9.36	
	Total						43.44

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	11.000	0.350	10.01
	(+)Haunch	cum	2	11.00	0.01125		0.25
	Total						10.26



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					0.82
						Total	0.82
10	Bituminous Concrete						
		cum	1	2.60	10.00	0.04	1.04
						Total	1.04
11	Mastic Asphalt						
		sqm	1	2.60	10.00		26.00
						Total	26.00
12	Tack Coat						
		sqm	1	2.60	10.00		26.00
						Total	26.00
13	RCC M-40 Crash Barrier	m	2	2.60			5.20
						Total	5.20
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallel to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.60	2.558		13.30
						Total	13.30



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	4.600	12.000	0.830	45.82
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum	4	4.390	3.500	0.550	33.80
						Total	93.16

2	PCC-M15						
	Box culvert	cum	1	3.600	8.760	0.150	4.73
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	4	3.990	2.700	0.150	6.46
						Total	12.97

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	11.000	0.380	15.05
	Box Side Wall	cum	2	11.00	2.295	0.300	15.15
	Base slab of Return wall II	cum	4	3.890	2.500	0.250	9.73
	Return wall I	cum	4	0.500	2.645	0.250	1.32
	Return wall II	cum	4	3.890	0.225	2.775	9.72
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	55.40

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.43
						Total	4.43

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.5/2 =$					5	
	No of weep holes in vertical direction per abutment = $2/1 =$					2	
	No of weep holes in horizontal direction per return wall = $3/2 =$					3	
	No of weep holes in vertical direction per return wall = $2/1 =$					2	
	Total no of Weep holes per abutment = 5×2					10	
	Total no of Weep holes per return wall = 3×2					6	
	Total mtrs of weep holes = $10 \times 2 + 6 \times 4$					Total	22.00

6	Filter media						
	Behind Abutment	cum	2	10.500	0.600	1.995	25.14
	Behind Return Wall	cum	4	4.390	0.600	2.345	24.71
						Total	49.84

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					93.16
	Less for PCC	cum					12.97
	Less for Bottom Slab RCC	cum					15.05
	Less for Shear Key RCC	cum					4.19
	Less for Return Wall-I RCC	cum	4	0.500	0.250	0.300	0.15
	Less for Return Wall-II Base Slab	cum					9.73
	Less for Return Wall-II Stem Wall	cum	4	3.890	0.250	0.430	1.67
	Less for Box above Invert upto EGL	cum	1	2.60	12.000	0.300	9.36
						Total	40.04

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	11.000	0.350	10.01
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	10.26



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					0.82
						Total	0.82
10	Bituminous Concrete						
		cum	1	2.60	10.00	0.04	1.04
						Total	1.04
11	Mastic Asphalt						
		sqm	1	2.60	10.00		26.00
						Total	26.00
12	Tack Coat						
		sqm	1	2.60	10.00		26.00
						Total	26.00
13	RCC M-40 Crash Barrier	m	2	2.60			5.20
						Total	5.20
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallel to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.60	2.558		13.30
						Total	13.30



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	4.600	12.000	0.830	45.82
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum	4	4.560	3.500	0.550	35.11
	Total						94.47

2	PCC-M15						
	Box culvert	cum	1	3.600	8.760	0.150	4.73
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	4	4.160	2.700	0.150	6.74
	Total						13.25

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	11.000	0.380	15.05
	Box Side Wall	cum	2	11.00	2.350	0.300	15.51
	Base slab of Return wall II	cum	4	4.060	2.500	0.250	10.15
	Return wall I	cum	4	0.500	2.700	0.250	1.35
	Return wall II	cum	4	4.060	0.225	2.830	10.34
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	11.000	0.01125		0.25
	Total=						56.84

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.55
	Total						4.55

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.5/2 =$						5
	No of weep holes in vertical direction per abutment = $2.1/1 =$						3
	No of weep holes in horizontal direction per return wall = $3/2 =$						3
	No of weep holes in vertical direction per return wall = $2.1/1 =$						3
	Total no of Weep holes per abutment = 5×3						15
Total no of Weep holes per return wall = 3×3						9	
	Total						33.00

6	Filter media						
	Behind Abutment	cum	2	10.500	0.600	2.050	25.83
	Behind Return Wall	cum	4	4.560	0.600	2.400	26.27
	Total						52.10

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					94.47
	Less for PCC	cum					13.25
	Less for Bottom Slab RCC	cum					15.05
	Less for Shear Key RCC	cum					4.19
	Less for Return Wall-I RCC	cum	4	0.500	0.250	0.300	0.15
	Less for Return Wall-II Base Slab	cum					10.15
	Less for Return Wall-II Stem Wall	cum	4	4.060	0.250	0.430	1.75
Less for Box above Invert upto EGL	cum	1	2.60	12.000	0.300	9.36	
	Total						40.57

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	11.000	0.350	10.01
	(+)Haunch	cum	2	11.00	0.01125		0.25
	Total						10.26



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					0.82
						Total	0.82
10	Bituminous Concrete						
		cum	1	2.60	10.00	0.04	1.04
						Total	1.04
11	Mastic Asphalt						
		sqm	1	2.60	10.00		26.00
						Total	26.00
12	Tack Coat						
		sqm	1	2.60	10.00		26.00
						Total	26.00
13	RCC M-40 Crash Barrier	m	2	2.60			5.20
						Total	5.20
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallel to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.60	2.558		13.30
						Total	13.30



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	4.600	13.000	0.830	49.63
	Shear Key	cum	2	4.800	1.720	0.820	13.54
	Return Wall II	cum	4	3.510	3.500	0.550	27.03
						Total	90.20

2	PCC-M15						
	Box culvert	cum	1	3.600	9.760	0.150	5.27
	Shear Key	cum	2	3.800	1.560	0.150	1.78
	Return Wall II	cum	4	3.110	2.700	0.150	5.04
						Total	12.09

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	3.600	12.000	0.380	16.42
	Box Side Wall	cum	2	12.00	2.000	0.300	14.40
	Base slab of Return wall II	cum	4	3.010	2.500	0.250	7.53
	Return wall I	cum	4	0.500	2.350	0.250	1.18
	Return wall II	cum	4	3.010	0.225	2.480	6.72
	Shear Key	cum	2	3.600	0.58220		4.19
	Haunch	cum	2	12.000	0.01125		0.27
						Total=	50.70

4	Steel						
	@ 80 Kg per cum of concrete	ton					4.06
						Total	4.06

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $11.5/2 =$					6	
	No of weep holes in vertical direction per abutment = $1.7/1 =$					2	
	No of weep holes in horizontal direction per return wall = $3/2 =$					2	
	No of weep holes in vertical direction per return wall = $1.7/1 =$					2	
	Total no of Weep holes per abutment = 6×2					12	
Total no of Weep holes per return wall = 2×2					4		
						Total	20.00

6	Filter media						
	Behind Abutment	cum	2	11.500	0.600	1.700	23.46
	Behind Return Wall	cum	4	3.510	0.600	2.050	17.27
						Total	40.73

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					90.20
	Less for PCC	cum					12.09
	Less for Bottom Slab RCC	cum					16.42
	Less for Shear Key RCC	cum					4.19
	Less for Return Wall-I RCC	cum	4	0.500	0.250	0.300	0.15
	Less for Return Wall-II Base Slab	cum					7.53
	Less for Return Wall-II Stem Wall	cum	4	3.010	0.250	0.430	1.29
Less for Box above Invert upto EGL	cum	1	2.60	13.000	0.300	10.14	
						Total	38.40

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.600	12.000	0.419	13.07
	(+)Haunch	cum	2	12.00	0.01125		0.27
						Total	13.34



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					1.07
						Total	1.07
10	Bituminous Concrete						
		cum	1	2.60	11.00	0.04	1.14
						Total	1.14
11	Mastic Asphalt						
		sqm	1	2.60	11.00		28.60
						Total	28.60
12	Tack Coat						
		sqm	1	2.60	11.00		28.60
						Total	28.60
13	RCC M-40 Crash Barrier	m	2	2.60			5.20
						Total	5.20
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/22/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.60	2.558		13.30
						Total	13.30



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =10.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	6.300	11.500	0.870	63.03
	Shear Key	cum	2	6.500	1.680	0.780	17.04
	Return Wall II	cum	4	4.240	4.300	0.600	43.76
						Total	123.82

2	PCC-M15						
	Box culvert	cum	1	5.300	8.340	0.150	6.63
	Shear Key	cum	2	5.500	1.503	0.150	2.48
	Return Wall II	cum	4	3.840	3.500	0.150	8.06
						Total	17.17

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.300	10.500	0.420	23.37
	Box Side Wall	cum	2	10.50	3.000	0.350	22.05
	Base slab of Return wall II	cum	4	3.740	3.300	0.300	14.81
	Return wall I	cum	4	1.300	3.370	0.300	5.26
	Return wall II	cum	4	3.740	0.275	3.490	14.36
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	10.500	0.01125		0.24
						Total=	85.79

4	Steel						
	@ 80 Kg per cum of concrete	ton					6.86
						Total	6.86

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $9.9/2 =$						5
	No of weep holes in vertical direction per abutment = $2.7/1 =$						3
	No of weep holes in horizontal direction per return wall = $4.5/2 =$						3
	No of weep holes in vertical direction per return wall = $2.7/1 =$						3
	Total no of Weep holes per abutment = 5×3						15
Total no of Weep holes per return wall = 3×3						9	
						Total	33.00

6	Filter media						
	Behind Abutment	cum	2	9.900	0.600	2.700	32.08
	Behind Return Wall	cum	4	5.040	0.600	3.070	37.13
						Total	69.21

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					123.82
	Less for PCC	cum					17.17
	Less for Bottom Slab RCC	cum					23.37
	Less for Shear Key RCC	cum					5.70
	Less for Return Wall-I RCC	cum	4	1.300	0.300	0.300	0.47
	Less for Return Wall-II Base Slab	cum					14.81
	Less for Return Wall-II Stem Wall	cum	4	3.740	0.350	0.420	2.20
Less for Box above Invert upto EGL	cum	1	2.70	11.500	0.300	9.32	
						Total	50.78

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.700	10.500	0.501	14.19
	(+)Haunch	cum	2	10.50	0.01125		0.24
						Total	14.43



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =10.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					1.15
						Total	1.15
10	Bituminous Concrete						
		cum	1	2.70	9.50	0.04	1.03
						Total	1.03
11	Mastic Asphalt						
		sqm	1	2.70	9.50		25.65
						Total	25.65
12	Tack Coat						
		sqm	1	2.70	9.50		25.65
						Total	25.65
13	RCC M-40 Crash Barrier	m	2	2.70			5.40
						Total	5.40
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =10.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.70	2.558		13.81
						Total	13.81



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	6.300	12.000	0.870	65.77
	Shear Key	cum	2	6.500	1.680	0.780	17.04
	Return Wall II	cum	4	4.240	4.300	0.600	43.76
						Total	126.56

2	PCC-M15						
	Box culvert	cum	1	5.300	8.840	0.150	7.03
	Shear Key	cum	2	5.500	1.503	0.150	2.48
	Return Wall II	cum	4	3.840	3.500	0.150	8.06
						Total	17.57

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.300	11.000	0.420	24.49
	Box Side Wall	cum	2	11.00	3.000	0.350	23.10
	Base slab of Return wall II	cum	4	3.740	3.300	0.300	14.81
	Return wall I	cum	4	1.300	3.370	0.300	5.26
	Return wall II	cum	4	3.740	0.275	3.490	14.36
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	87.96

4	Steel						
	@ 80 Kg per cum of concrete	ton					7.04
						Total	7.04

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.4/2 =$						5
	No of weep holes in vertical direction per abutment = $2.7/1 =$						3
	No of weep holes in horizontal direction per return wall = $4.5/2 =$						3
	No of weep holes in vertical direction per return wall = $2.7/1 =$						3
	Total no of Weep holes per abutment = 5×3						15
Total no of Weep holes per return wall = 3×3						9	
						Total	33.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	2.700	33.70
	Behind Return Wall	cum	4	5.040	0.600	3.070	37.13
						Total	70.83

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					126.56
	Less for PCC	cum					17.57
	Less for Bottom Slab RCC	cum					24.49
	Less for Shear Key RCC	cum					5.70
	Less for Return Wall-I RCC	cum	4	1.300	0.300	0.300	0.47
	Less for Return Wall-II Base Slab	cum					14.81
	Less for Return Wall-II Stem Wall	cum	4	3.740	0.350	0.420	2.20
Less for Box above Invert upto EGL	cum	1	2.70	12.000	0.300	9.72	
						Total	51.60

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.700	11.000	0.433	12.85
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	13.09



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					1.05
						Total	1.05
10	Bituminous Concrete						
		cum	1	2.70	10.00	0.04	1.08
						Total	1.08
11	Mastic Asphalt						
		sqm	1	2.70	10.00		27.00
						Total	27.00
12	Tack Coat						
		sqm	1	2.70	10.00		27.00
						Total	27.00
13	RCC M-40 Crash Barrier	m	2	2.70			5.40
						Total	5.40
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallel to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.70	2.558		13.81
						Total	13.81



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	6.300	12.000	0.870	65.77
	Shear Key	cum	2	6.500	1.680	0.780	17.04
	Return Wall II	cum	4	5.120	5.150	0.700	73.83
						Total	156.64

2	PCC-M15						
	Box culvert	cum	1	5.300	8.840	0.150	7.03
	Shear Key	cum	2	5.500	1.503	0.150	2.48
	Return Wall II	cum	4	4.720	4.350	0.150	12.32
						Total	21.83

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.300	11.000	0.420	24.49
	Box Side Wall	cum	2	11.00	3.295	0.350	25.37
	Base slab of Return wall II	cum	4	4.620	4.150	0.400	30.68
	Return wall I	cum	4	1.300	3.665	0.300	5.72
	Return wall II	cum	4	4.620	0.325	3.685	22.13
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	114.34

4	Steel						
	@ 80 Kg per cum of concrete	ton					9.15
						Total	9.15

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.4/2 =$						5
	No of weep holes in vertical direction per abutment = $3/1 =$						3
	No of weep holes in horizontal direction per return wall = $4.5/2 =$						3
	No of weep holes in vertical direction per return wall = $3/1 =$						3
	Total no of Weep holes per abutment = 5×3						15
Total no of Weep holes per return wall = 3×3						9	
						Total	33.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	2.995	37.38
	Behind Return Wall	cum	4	5.920	0.600	3.365	47.81
						Total	85.19

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					156.64
	Less for PCC	cum					21.83
	Less for Bottom Slab RCC	cum					24.49
	Less for Shear Key RCC	cum					5.70
	Less for Return Wall-I RCC	cum	4	1.300	0.300	0.300	0.47
	Less for Return Wall-II Base Slab	cum					30.68
	Less for Return Wall-II Stem Wall	cum	4	4.620	0.450	0.320	2.66
Less for Box above Invert upto EGL	cum	1	2.70	12.000	0.300	9.72	
						Total	61.09

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.700	11.000	0.370	10.99
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	11.24



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					0.90
						Total	0.90
10	Bituminous Concrete						
		cum	1	2.70	10.00	0.04	1.08
						Total	1.08
11	Mastic Asphalt						
		sqm	1	2.70	10.00		27.00
						Total	27.00
12	Tack Coat						
		sqm	1	2.70	10.00		27.00
						Total	27.00
13	RCC M-40 Crash Barrier	m	2	2.70			5.40
						Total	5.40
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallel to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.70	2.558		13.81
						Total	13.81



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	6.300	12.000	0.870	65.77
	Shear Key	cum	2	6.500	1.680	0.780	17.04
	Return Wall II	cum	4	5.290	5.150	0.700	76.28
						Total	159.09

2	PCC-M15						
	Box culvert	cum	1	5.300	8.840	0.150	7.03
	Shear Key	cum	2	5.500	1.503	0.150	2.48
	Return Wall II	cum	4	4.890	4.350	0.150	12.76
						Total	22.27

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.300	11.000	0.420	24.49
	Box Side Wall	cum	2	11.00	3.350	0.350	25.80
	Base slab of Return wall II	cum	4	4.790	4.150	0.400	31.81
	Return wall I	cum	4	1.300	3.720	0.300	5.80
	Return wall II	cum	4	4.790	0.325	3.740	23.29
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	117.13

4	Steel						
	@ 80 Kg per cum of concrete	ton					9.37
						Total	9.37

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.4/2 =$						5
	No of weep holes in vertical direction per abutment = $3.1/1 =$						4
	No of weep holes in horizontal direction per return wall = $4.5/2 =$						4
	No of weep holes in vertical direction per return wall = $3.1/1 =$						4
	Total no of Weep holes per abutment = 5×4						20
Total no of Weep holes per return wall = 4×4						16	
						Total	52.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	3.050	38.06
	Behind Return Wall	cum	4	6.090	0.600	3.420	49.99
						Total	88.05

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					159.09
	Less for PCC	cum					22.27
	Less for Bottom Slab RCC	cum					24.49
	Less for Shear Key RCC	cum					5.70
	Less for Return Wall-I RCC	cum	4	1.300	0.300	0.300	0.47
	Less for Return Wall-II Base Slab	cum					31.81
	Less for Return Wall-II Stem Wall	cum	4	4.790	0.450	0.320	2.76
Less for Box above Invert upto EGL	cum	1	2.70	12.000	0.300	9.72	
						Total	61.87

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.700	11.000	0.370	10.99
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	11.24



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					0.90
						Total	0.90
10	Bituminous Concrete						
		cum	1	2.70	10.00	0.04	1.08
						Total	1.08
11	Mastic Asphalt						
		sqm	1	2.70	10.00		27.00
						Total	27.00
12	Tack Coat						
		sqm	1	2.70	10.00		27.00
						Total	27.00
13	RCC M-40 Crash Barrier	m	2	2.70			5.40
						Total	5.40
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.70	2.558		13.81
						Total	13.81



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	6.300	13.000	0.870	71.25
	Shear Key	cum	2	6.500	1.680	0.780	17.04
	Return Wall II	cum	4	4.240	4.300	0.600	43.76
						Total	132.05

2	PCC-M15						
	Box culvert	cum	1	5.300	9.840	0.150	7.82
	Shear Key	cum	2	5.500	1.503	0.150	2.48
	Return Wall II	cum	4	3.840	3.500	0.150	8.06
						Total	18.37

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.300	12.000	0.420	26.71
	Box Side Wall	cum	2	12.00	3.000	0.350	25.20
	Base slab of Return wall II	cum	4	3.740	3.300	0.300	14.81
	Return wall I	cum	4	1.300	3.370	0.300	5.26
	Return wall II	cum	4	3.740	0.275	3.490	14.36
	Shear Key	cum	2	5.300	0.53820		5.70
	Haunch	cum	2	12.000	0.01125		0.27
						Total=	92.31

4	Steel						
	@ 80 Kg per cum of concrete	ton					7.38
						Total	7.38

5	Weep holes						
	Spacing for weep holes = 2 m. in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $11.4/2 =$						6
	No of weep holes in vertical direction per abutment = $2.7/1 =$						3
	No of weep holes in horizontal direction per return wall = $4.5/2 =$						3
	No of weep holes in vertical direction per return wall = $2.7/1 =$						3
	Total no of Weep holes per abutment = 6×3						18
Total no of Weep holes per return wall = 3×3						9	
						Total	36.00

6	Filter media						
	Behind Abutment	cum	2	11.400	0.600	2.700	36.94
	Behind Return Wall	cum	4	5.040	0.600	3.070	37.13
						Total	74.07

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					132.05
	Less for PCC	cum					18.37
	Less for Bottom Slab RCC	cum					26.71
	Less for Shear Key RCC	cum					5.70
	Less for Return Wall-I RCC	cum	4	1.300	0.300	0.300	0.47
	Less for Return Wall-II Base Slab	cum					14.81
	Less for Return Wall-II Stem Wall	cum	4	3.740	0.350	0.420	2.20
Less for Box above Invert upto EGL	cum	1	2.70	13.000	0.300	10.53	
						Total	53.25

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	2.700	12.000	0.439	14.22
	(+)Haunch	cum	2	12.00	0.01125		0.27
						Total	14.49



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					1.16
						Total	1.16
10	Bituminous Concrete						
		cum	1	2.70	11.00	0.04	1.19
						Total	1.19
11	Mastic Asphalt						
		sqm	1	2.70	11.00		29.70
						Total	29.70
12	Tack Coat						
		sqm	1	2.70	11.00		29.70
						Total	29.70
13	RCC M-40 Crash Barrier	m	2	2.70			5.40
						Total	5.40
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	3.400	2.00	0.30	2.04
						Total	2.04
16	PCC M 15 below Catch Pit						
		cum	1	2.400	1.50	0.30	1.08
						Total	1.08
17	Curtain Wall PCC M-20						
	Side wall length parallel to road	cum	1	2.400	0.360		0.86
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	1.94
18	300 mm Boulder Pitching						
		cum	1	1.800	1.50	0.30	0.81
		cum	1	2.666	1.50	0.30	1.20
						Total	2.01
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/23/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	7.727	0.95	0.150	1.10
	For PCC wall						
		cum	1	3.184	0.35	1.000	1.11
		cum	1	4.569	0.35	1.600	2.56
		cum	1	5.955	0.35	1.600	3.33
	Below PCC Wall						
		cum	1	3.384	0.55	0.100	0.19
		cum	1	4.769	0.55	0.100	0.26
		cum	1	6.155	0.55	0.100	0.34
	On trades						
		cum	1	2.491	0.85	0.100	0.21
		cum	1	3.876	0.85	0.100	0.33
		cum	1	5.262	0.85	0.100	0.45
		cum	1	6.734	1.00	0.100	0.67
						Total	10.56
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	8.327	1.55	1.95	25.17
	Stone Pitching and side wall	cum	1	5.014	3.320		16.64
						Total	41.81
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	7.427	1.003		7.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	9.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	2.491	0.85	0.300	0.64
		cum	1	3.876	0.85	0.300	0.99
		cum	1	5.262	0.85	0.300	1.34
		cum	1	6.734	1.00	0.300	2.02
						Total	4.99
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	2.70	2.558		13.81
						Total	13.81



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/33/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	6.640	12.000	0.870	69.32
	Shear Key	cum	2	6.840	1.680	0.780	17.93
	Return Wall II	cum	4	4.710	4.300	0.600	48.61
						Total	135.86

2	PCC-M15						
	Box culvert	cum	1	5.640	8.840	0.150	7.48
	Shear Key	cum	2	5.840	1.503	0.150	2.63
	Return Wall II	cum	4	4.310	3.500	0.150	9.05
						Total	19.16

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.640	11.000	0.420	26.06
	Box Side Wall	cum	2	11.00	3.000	0.420	27.72
	Base slab of Return wall II	cum	4	4.210	3.300	0.300	16.67
	Return wall I	cum	4	0.900	3.420	0.250	3.08
	Return wall II	cum	4	4.210	0.275	3.540	16.39
	Shear Key	cum	2	5.640	0.53820		6.07
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	96.24

4	Steel						
	@ 80 Kg per cum of concrete	ton					7.70
						Total	7.70

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.5/2 =$						5
	No of weep holes in vertical direction per abutment = $2.7/1 =$						3
	No of weep holes in horizontal direction per return wall = $4.5/2 =$						3
	No of weep holes in vertical direction per return wall = $2.7/1 =$						3
	Total no of Weep holes per abutment = 5×3						15
Total no of Weep holes per return wall = 3×3						9	
						Total	33.00

6	Filter media						
	Behind Abutment	cum	2	10.500	0.600	2.700	34.02
	Behind Return Wall	cum	4	5.110	0.600	3.120	38.26
						Total	72.28

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					135.86
	Less for PCC	cum					19.16
	Less for Bottom Slab RCC	cum					26.06
	Less for Shear Key RCC	cum					6.07
	Less for Return Wall-I RCC	cum	4	0.900	0.250	0.300	0.27
	Less for Return Wall-II Base Slab	cum					16.67
	Less for Return Wall-II Stem Wall	cum	4	4.210	0.350	0.420	2.48
Less for Box above Invert upto EGL	cum	1	3.84	12.000	0.300	13.82	
						Total	51.32

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	3.840	11.000	0.483	20.38
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	20.63



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/33/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					1.65
						Total	1.65
10	Bituminous Concrete						
		cum	1	3.84	10.00	0.04	1.54
						Total	1.54
11	Mastic Asphalt						
		sqm	1	3.84	10.00		38.40
						Total	38.40
12	Tack Coat						
		sqm	1	3.84	10.00		38.40
						Total	38.40
13	RCC M-40 Crash Barrier	m	2	3.84			7.68
						Total	7.68
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	4.400	2.00	0.30	2.64
						Total	2.64
16	PCC M 15 below Catch Pit						
		cum	1	3.400	1.50	0.30	1.53
						Total	1.53
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	3.400	0.360		1.22
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.30
18	300 mm Boulder Pitching						
		cum	1	2.800	1.50	0.30	1.26
		cum	1	3.666	1.50	0.30	1.65
						Total	2.91
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/33/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	8.727	0.95	0.150	1.24
	For PCC wall						
		cum	1	4.184	0.35	1.000	1.46
		cum	1	5.569	0.35	1.600	3.12
		cum	1	6.955	0.35	1.600	3.89
	Below PCC Wall						
		cum	1	4.384	0.55	0.100	0.24
		cum	1	5.769	0.55	0.100	0.32
		cum	1	7.155	0.55	0.100	0.39
	On trades						
		cum	1	3.491	0.85	0.100	0.30
		cum	1	4.876	0.85	0.100	0.41
		cum	1	6.262	0.85	0.100	0.53
		cum	1	7.734	1.00	0.100	0.77
						Total	12.69
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	9.327	1.55	1.95	28.19
	Stone Pitching and side wall	cum	1	6.014	3.320		19.96
						Total	48.16
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	8.427	1.003		8.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	10.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	3.491	0.85	0.300	0.89
		cum	1	4.876	0.85	0.300	1.24
		cum	1	6.262	0.85	0.300	1.60
		cum	1	7.734	1.00	0.300	2.32
						Total	6.05
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	3.84	2.558		19.65
						Total	19.65



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =10 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	8.320	11.000	0.930	85.11
	Shear Key	cum	2	8.520	1.620	0.720	19.88
	Return Wall II	cum	4	5.460	5.150	0.700	78.73
						Total	183.72

2	PCC-M15						
	Box culvert	cum	1	7.320	7.960	0.150	8.74
	Shear Key	cum	2	7.520	1.418	0.150	3.20
	Return Wall II	cum	4	5.060	4.350	0.150	13.21
						Total	25.15

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	7.320	10.000	0.480	35.14
	Box Side Wall	cum	2	10.00	4.000	0.460	36.80
	Base slab of Return wall II	cum	4	4.960	4.150	0.400	32.93
	Return wall I	cum	4	1.700	4.450	0.300	9.08
	Return wall II	cum	4	4.960	0.325	4.530	29.21
	Shear Key	cum	2	7.320	0.47520		6.96
	Haunch	cum	2	10.000	0.01125		0.23
						Total=	150.34

4	Steel						
	@ 80 Kg per cum of concrete	ton					12.03
						Total	12.03

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $9.4/2 =$					5	
	No of weep holes in vertical direction per abutment = $3.7/1 =$					4	
	No of weep holes in horizontal direction per return wall = $6/2 =$					4	
	No of weep holes in vertical direction per return wall = $3.7/1 =$					4	
	Total no of Weep holes per abutment = 5×4					20	
Total no of Weep holes per return wall = 4×4					16		
						Total	52.00

6	Filter media						
	Behind Abutment	cum	2	9.400	0.600	3.700	41.74
	Behind Return Wall	cum	4	6.660	0.600	4.150	66.33
						Total	108.07

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					183.72
	Less for PCC	cum					25.15
	Less for Bottom Slab RCC	cum					35.14
	Less for Shear Key RCC	cum					6.96
	Less for Return Wall-I RCC	cum	4	1.700	0.300	0.300	0.61
	Less for Return Wall-II Base Slab	cum					32.93
	Less for Return Wall-II Stem Wall	cum	4	4.960	0.450	0.380	3.39
Less for Box above Invert upto EGL	cum	1	3.92	11.000	0.300	12.94	
						Total	66.61

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	3.920	10.000	0.506	19.85
	(+)Haunch	cum	2	10.00	0.01125		0.23
						Total	20.07



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =10 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					1.61
						Total	1.61
10	Bituminous Concrete						
		cum	1	3.92	9.00	0.04	1.41
						Total	1.41
11	Mastic Asphalt						
		sqm	1	3.92	9.00		35.28
						Total	35.28
12	Tack Coat						
		sqm	1	3.92	9.00		35.28
						Total	35.28
13	RCC M-40 Crash Barrier	m	2	3.92			7.84
						Total	7.84
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	4.400	2.00	0.30	2.64
						Total	2.64
16	PCC M 15 below Catch Pit						
		cum	1	3.400	1.50	0.30	1.53
						Total	1.53
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	3.400	0.360		1.22
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.30
18	300 mm Boulder Pitching						
		cum	1	2.800	1.50	0.30	1.26
		cum	1	3.666	1.50	0.30	1.65
						Total	2.91
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =10 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	8.727	0.95	0.150	1.24
	For PCC wall						
		cum	1	4.184	0.35	1.000	1.46
		cum	1	5.569	0.35	1.600	3.12
		cum	1	6.955	0.35	1.600	3.89
	Below PCC Wall						
		cum	1	4.384	0.55	0.100	0.24
		cum	1	5.769	0.55	0.100	0.32
		cum	1	7.155	0.55	0.100	0.39
	On trades						
		cum	1	3.491	0.85	0.100	0.30
		cum	1	4.876	0.85	0.100	0.41
		cum	1	6.262	0.85	0.100	0.53
		cum	1	7.734	1.00	0.100	0.77
						Total	12.69
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	9.327	1.55	1.95	28.19
	Stone Pitching and side wall	cum	1	6.014	3.320		19.96
						Total	48.16
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	8.427	1.003		8.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	10.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	3.491	0.85	0.300	0.89
		cum	1	4.876	0.85	0.300	1.24
		cum	1	6.262	0.85	0.300	1.60
		cum	1	7.734	1.00	0.300	2.32
						Total	6.05
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	3.92	2.558		20.05
						Total	20.05



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	8.320	12.000	0.930	92.85
	Shear Key	cum	2	8.520	1.620	0.720	19.88
	Return Wall II	cum	4	5.460	5.150	0.700	78.73
						Total	191.46

2	PCC-M15						
	Box culvert	cum	1	7.320	8.960	0.150	9.84
	Shear Key	cum	2	7.520	1.418	0.150	3.20
	Return Wall II	cum	4	5.060	4.350	0.150	13.21
						Total	26.24

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	7.320	11.000	0.480	38.65
	Box Side Wall	cum	2	11.00	4.000	0.460	40.48
	Base slab of Return wall II	cum	4	4.960	4.150	0.400	32.93
	Return wall I	cum	4	1.700	4.450	0.300	9.08
	Return wall II	cum	4	4.960	0.325	4.530	29.21
	Shear Key	cum	2	7.320	0.47520		6.96
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	157.56

4	Steel						
	@ 80 Kg per cum of concrete	ton					12.60
						Total	12.60

5	Weep holes						
	Spacing for weep holes = 2 m. in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.4/2 =$					5	
	No of weep holes in vertical direction per abutment = $3.7/1 =$					4	
	No of weep holes in horizontal direction per return wall = $6/2 =$					4	
	No of weep holes in vertical direction per return wall = $3.7/1 =$					4	
	Total no of Weep holes per abutment = 5×4					20	
Total no of Weep holes per return wall = 4×4					16		
						Total	52.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	3.700	46.18
	Behind Return Wall	cum	4	6.660	0.600	4.150	66.33
						Total	112.51

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					191.46
	Less for PCC	cum					26.24
	Less for Bottom Slab RCC	cum					38.65
	Less for Shear Key RCC	cum					6.96
	Less for Return Wall-I RCC	cum	4	1.700	0.300	0.300	0.61
	Less for Return Wall-II Base Slab	cum					32.93
	Less for Return Wall-II Stem Wall	cum	4	4.960	0.450	0.380	3.39
Less for Box above Invert upto EGL	cum	1	3.92	12.000	0.300	14.11	
						Total	68.56

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	3.920	11.000	0.513	22.10
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	22.35



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					1.79
						Total	1.79
10	Bituminous Concrete						
		cum	1	3.92	10.00	0.04	1.57
						Total	1.57
11	Mastic Asphalt						
		sqm	1	3.92	10.00		39.20
						Total	39.20
12	Tack Coat						
		sqm	1	3.92	10.00		39.20
						Total	39.20
13	RCC M-40 Crash Barrier	m	2	3.92			7.84
						Total	7.84
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	4.400	2.00	0.30	2.64
						Total	2.64
16	PCC M 15 below Catch Pit						
		cum	1	3.400	1.50	0.30	1.53
						Total	1.53
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	3.400	0.360		1.22
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.30
18	300 mm Boulder Pitching						
		cum	1	2.800	1.50	0.30	1.26
		cum	1	3.666	1.50	0.30	1.65
						Total	2.91
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	8.727	0.95	0.150	1.24
	For PCC wall						
		cum	1	4.184	0.35	1.000	1.46
		cum	1	5.569	0.35	1.600	3.12
		cum	1	6.955	0.35	1.600	3.89
	Below PCC Wall						
		cum	1	4.384	0.55	0.100	0.24
		cum	1	5.769	0.55	0.100	0.32
		cum	1	7.155	0.55	0.100	0.39
	On trades						
		cum	1	3.491	0.85	0.100	0.30
		cum	1	4.876	0.85	0.100	0.41
		cum	1	6.262	0.85	0.100	0.53
		cum	1	7.734	1.00	0.100	0.77
						Total	12.69
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	9.327	1.55	1.95	28.19
	Stone Pitching and side wall	cum	1	6.014	3.320		19.96
						Total	48.16
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	8.427	1.003		8.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	10.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	3.491	0.85	0.300	0.89
		cum	1	4.876	0.85	0.300	1.24
		cum	1	6.262	0.85	0.300	1.60
		cum	1	7.734	1.00	0.300	2.32
						Total	6.05
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	3.92	2.558		20.05
						Total	20.05



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =10.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	8.320	11.500	0.930	88.98
	Shear Key	cum	2	8.520	1.620	0.720	19.88
	Return Wall II	cum	4	6.450	5.300	0.750	102.56
						Total	211.41

2	PCC-M15						
	Box culvert	cum	1	7.320	8.460	0.150	9.29
	Shear Key	cum	2	7.520	1.418	0.150	3.20
	Return Wall II	cum	4	6.050	4.500	0.150	16.34
						Total	28.82

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	7.320	10.500	0.480	36.89
	Box Side Wall	cum	2	10.50	4.333	0.460	41.85
	Base slab of Return wall II	cum	4	5.950	4.300	0.450	46.05
	Return wall I	cum	4	1.700	4.783	0.300	9.76
	Return wall II	cum	4	5.950	0.375	4.813	42.95
	Shear Key	cum	2	7.320	0.47520		6.96
	Haunch	cum	2	10.500	0.01125		0.24
						Total=	184.70

4	Steel						
	@ 80 Kg per cum of concrete	ton					14.78
						Total	14.78

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $9.9/2 =$					5	
	No of weep holes in vertical direction per abutment = $4/1 =$					5	
	No of weep holes in horizontal direction per return wall = $6/2 =$					4	
	No of weep holes in vertical direction per return wall = $4/1 =$					5	
	Total no of Weep holes per abutment = 5×5					25	
	Total no of Weep holes per return wall = 4×5					20	
	Total mtrs of weep holes = $25 \times 2 + 20 \times 4$					Total	65.00

6	Filter media						
	Behind Abutment	cum	2	9.900	0.600	4.033	47.91
	Behind Return Wall	cum	4	7.650	0.600	4.483	82.30
						Total	130.20

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					211.41
	Less for PCC	cum					28.82
	Less for Bottom Slab RCC	cum					36.89
	Less for Shear Key RCC	cum					6.96
	Less for Return Wall-I RCC	cum	4	1.700	0.300	0.300	0.61
	Less for Return Wall-II Base Slab	cum					46.05
	Less for Return Wall-II Stem Wall	cum	4	5.950	0.500	0.330	3.93
	Less for Box above Invert upto EGL	cum	1	3.92	11.500	0.300	13.52
						Total	74.62

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	3.920	10.500	0.450	18.52
	(+)Haunch	cum	2	10.50	0.01125		0.24
						Total	18.76



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =10.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					1.50
						Total	1.50
10	Bituminous Concrete						
		cum	1	3.92	9.50	0.04	1.49
						Total	1.49
11	Mastic Asphalt						
		sqm	1	3.92	9.50		37.24
						Total	37.24
12	Tack Coat						
		sqm	1	3.92	9.50		37.24
						Total	37.24
13	RCC M-40 Crash Barrier	m	2	3.92			7.84
						Total	7.84
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	4.400	2.00	0.30	2.64
						Total	2.64
16	PCC M 15 below Catch Pit						
		cum	1	3.400	1.50	0.30	1.53
						Total	1.53
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	3.400	0.360		1.22
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.30
18	300 mm Boulder Pitching						
		cum	1	2.800	1.50	0.30	1.26
		cum	1	3.666	1.50	0.30	1.65
					Total	2.91	
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
					Total	1.16	



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =10.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	8.727	0.95	0.150	1.24
	For PCC wall						
		cum	1	4.184	0.35	1.000	1.46
		cum	1	5.569	0.35	1.600	3.12
		cum	1	6.955	0.35	1.600	3.89
	Below PCC Wall						
		cum	1	4.384	0.55	0.100	0.24
		cum	1	5.769	0.55	0.100	0.32
		cum	1	7.155	0.55	0.100	0.39
	On trades						
		cum	1	3.491	0.85	0.100	0.30
		cum	1	4.876	0.85	0.100	0.41
		cum	1	6.262	0.85	0.100	0.53
		cum	1	7.734	1.00	0.100	0.77
						Total	12.69
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	9.327	1.55	1.95	28.19
	Stone Pitching and side wall	cum	1	6.014		3.320	19.96
						Total	48.16
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	8.427		1.003	8.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	10.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	3.491	0.85	0.300	0.89
		cum	1	4.876	0.85	0.300	1.24
		cum	1	6.262	0.85	0.300	1.60
		cum	1	7.734	1.00	0.300	2.32
						Total	6.05
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	3.92		2.558	20.05
						Total	20.05



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	8.320	13.000	0.930	100.59
	Shear Key	cum	2	8.520	1.620	0.720	19.88
	Return Wall II	cum	4	5.460	5.150	0.700	78.73
						Total	199.20

2	PCC-M15						
	Box culvert	cum	1	7.320	9.960	0.150	10.94
	Shear Key	cum	2	7.520	1.418	0.150	3.20
	Return Wall II	cum	4	5.060	4.350	0.150	13.21
						Total	27.34

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	7.320	12.000	0.480	42.16
	Box Side Wall	cum	2	12.00	4.000	0.460	44.16
	Base slab of Return wall II	cum	4	4.960	4.150	0.400	32.93
	Return wall I	cum	4	1.700	4.450	0.300	9.08
	Return wall II	cum	4	4.960	0.325	4.530	29.21
	Shear Key	cum	2	7.320	0.47520		6.96
	Haunch	cum	2	12.000	0.01125		0.27
						Total=	164.77

4	Steel						
	@ 80 Kg per cum of concrete	ton					13.18
						Total	13.18

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $11.4/2 =$					6	
	No of weep holes in vertical direction per abutment = $3.7/1 =$					4	
	No of weep holes in horizontal direction per return wall = $6/2 =$					4	
	No of weep holes in vertical direction per return wall = $3.7/1 =$					4	
	Total no of Weep holes per abutment = 6×4					24	
Total no of Weep holes per return wall = 4×4					16		
						Total	56.00

6	Filter media						
	Behind Abutment	cum	2	11.400	0.600	3.700	50.62
	Behind Return Wall	cum	4	6.660	0.600	4.150	66.33
						Total	116.95

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					199.20
	Less for PCC	cum					27.34
	Less for Bottom Slab RCC	cum					42.16
	Less for Shear Key RCC	cum					6.96
	Less for Return Wall-I RCC	cum	4	1.700	0.300	0.300	0.61
	Less for Return Wall-II Base Slab	cum					32.93
	Less for Return Wall-II Stem Wall	cum	4	4.960	0.450	0.380	3.39
Less for Box above Invert upto EGL	cum	1	3.92	13.000	0.300	15.29	
						Total	70.51

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	3.920	12.000	0.519	24.40
	(+)Haunch	cum	2	12.00	0.01125		0.27
						Total	24.67



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					1.97
						Total	1.97
10	Bituminous Concrete						
		cum	1	3.92	11.00	0.04	1.72
						Total	1.72
11	Mastic Asphalt						
		sqm	1	3.92	11.00		43.12
						Total	43.12
12	Tack Coat						
		sqm	1	3.92	11.00		43.12
						Total	43.12
13	RCC M-40 Crash Barrier	m	2	3.92			7.84
						Total	7.84
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	4.400	2.00	0.30	2.64
						Total	2.64
16	PCC M 15 below Catch Pit						
		cum	1	3.400	1.50	0.30	1.53
						Total	1.53
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	3.400	0.360		1.22
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.30
18	300 mm Boulder Pitching						
		cum	1	2.800	1.50	0.30	1.26
		cum	1	3.666	1.50	0.30	1.65
						Total	2.91
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	8.727	0.95	0.150	1.24
	For PCC wall						
		cum	1	4.184	0.35	1.000	1.46
		cum	1	5.569	0.35	1.600	3.12
		cum	1	6.955	0.35	1.600	3.89
	Below PCC Wall						
		cum	1	4.384	0.55	0.100	0.24
		cum	1	5.769	0.55	0.100	0.32
		cum	1	7.155	0.55	0.100	0.39
	On trades						
		cum	1	3.491	0.85	0.100	0.30
		cum	1	4.876	0.85	0.100	0.41
		cum	1	6.262	0.85	0.100	0.53
		cum	1	7.734	1.00	0.100	0.77
						Total	12.69
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	9.327	1.55	1.95	28.19
	Stone Pitching and side wall	cum	1	6.014	3.320		19.96
						Total	48.16
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	8.427	1.003		8.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	10.44
23	300 mm Boulder Pitching						
	Below trades	cum	1	3.491	0.85	0.300	0.89
		cum	1	4.876	0.85	0.300	1.24
		cum	1	6.262	0.85	0.300	1.60
		cum	1	7.734	1.00	0.300	2.32
						Total	6.05
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	3.92	2.558		20.05
						Total	20.05



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	7.760	12.000	1.120	104.29
	Shear Key	cum	2	7.960	1.630	0.730	18.94
	Return Wall II	cum	4	7.580	6.300	1.150	219.67
						Total	342.91

2	PCC-M15						
	Box culvert	cum	1	6.760	8.940	0.150	9.07
	Shear Key	cum	2	6.960	1.432	0.150	2.99
	Return Wall II	cum	4	7.180	5.500	0.150	23.69
						Total	35.75

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	6.760	11.000	0.470	34.95
	Box Side Wall	cum	2	11.00	4.000	0.480	42.24
	Base slab of Return wall II	cum	4	7.080	5.300	0.650	97.56
	Return wall I	cum	4	1.400	4.390	0.300	7.37
	Return wall II	cum	4	7.080	0.450	5.485	69.90
	Shear Key	cum	2	6.760	0.48545		6.56
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	258.84

4	Steel						
	@ 80 Kg per cum of concrete	ton					20.71
						Total	20.71

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.4/2 =$						5
	No of weep holes in vertical direction per abutment = $3.7/1 =$						4
	No of weep holes in horizontal direction per return wall = $6/2 =$						5
	No of weep holes in vertical direction per return wall = $3.5/1 =$						4
	Total no of Weep holes per abutment = 5×4						20
	Total no of Weep holes per return wall = 5×4						20
	Total mtrs of weep holes = $20 \times 2 + 20 \times 4$					Total	60.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	3.520	43.93
	Behind Return Wall	cum	4	8.480	0.600	5.165	105.11
						Total	149.04

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					342.91
	Less for PCC	cum					35.75
	Less for Bottom Slab RCC	cum					34.95
	Less for Shear Key RCC	cum					6.56
	Less for Return Wall-I RCC	cum	4	1.400	0.300	0.500	0.84
	Less for Return Wall-II Base Slab	cum					97.56
	Less for Return Wall-II Stem Wall	cum	4	7.080	0.650	0.320	5.89
	Less for Box above Invert upto EGL	cum	1	3.96	12.000	0.500	23.76
						Total	137.59

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	3.960	11.000	0.390	16.98
	(+)Haunch	cum	2	11.00	0.01125		0.25
	(+)RCC Wall	cum	2	6.760	2.300	0.300	9.33
	(+)RCC Column	cum	4	0.600	0.900	1.400	3.02
						Total	29.58



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W=11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					2.37
						Total	2.37

PROTECTION WORK

Upstream side

10	Earthwork for excavation						
		cum	1	4.400	2.00	0.50	4.40
						Total	4.40

11	PCC M 15 below Catch Pit						
		cum	1	3.400	1.50	0.30	1.53
						Total	1.53

12	Catch Pit Stone Masonry/PCC M15						
	Side wall length parallel to road	cum	1	3.400	0.360		1.22
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.30

13	300 mm Boulder Pitching						
		cum	1	2.800	1.50	0.30	1.26
		cum	1	3.666	1.50	0.30	1.65
						Total	2.91

14	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W=11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
15	PCC M15 Downstream side						
	Below curtain wall	cum	1	8.727	0.95	0.150	1.24
	For PCC wall						
		cum	1	4.184	0.35	1.000	1.46
		cum	1	5.569	0.35	1.600	3.12
		cum	1	6.955	0.35	1.600	3.89
	Below PCC Wall						
		cum	1	4.384	0.55	0.100	0.24
		cum	1	5.769	0.55	0.100	0.32
		cum	1	7.155	0.55	0.100	0.39
	On trades						
		cum	1	3.491	0.85	0.100	0.30
		cum	1	4.876	0.85	0.100	0.41
		cum	1	6.262	0.85	0.100	0.53
		cum	1	7.734	1.00	0.100	0.77
					Total		12.69
16	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	9.327	1.55	1.95	28.19
	Stone Pitching and side wall	cum	1	6.014	3.320		19.96
					Total		48.16
17	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	8.427	1.003		8.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
					Total		10.44
18	300 mm Boulder Pitching						
	Below trades	cum	1	3.491	0.85	0.300	0.89
		cum	1	4.876	0.85	0.300	1.24
		cum	1	6.262	0.85	0.300	1.60
		cum	1	7.734	1.00	0.300	2.32
					Total		6.05



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W =10.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	7.760	11.500	1.120	99.95
	Shear Key	cum	2	7.960	1.630	0.730	18.94
	Return Wall II	cum	4	7.190	5.300	0.950	144.81
						Total	263.70

2	PCC-M15						
	Box culvert	cum	1	6.760	8.440	0.150	8.56
	Shear Key	cum	2	6.960	1.432	0.150	2.99
	Return Wall II	cum	4	6.790	4.500	0.150	18.33
						Total	29.88

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	6.760	10.500	0.470	33.36
	Box Side Wall	cum	2	10.50	4.000	0.480	40.32
	Base slab of Return wall II	cum	4	6.690	4.300	0.450	51.78
	Return wall I	cum	4	1.400	4.390	0.300	7.37
	Return wall II	cum	4	6.690	0.375	5.096	51.14
	Shear Key	cum	2	6.760	0.48545		6.56
	Haunch	cum	2	10.500	0.01125		0.24
						Total=	190.77

4	Steel						
	@ 80 Kg per cum of concrete	ton					15.26
						Total	15.26

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $9.9/2 =$						5
	No of weep holes in vertical direction per abutment = $3.7/1 =$						4
	No of weep holes in horizontal direction per return wall = $6/2 =$						5
	No of weep holes in vertical direction per return wall = $3.5/1 =$						4
	Total no of Weep holes per abutment = 5×4						20
	Total no of Weep holes per return wall = 5×4						20
	Total mtrs of weep holes = $20 \times 2 + 20 \times 4$					Total	60.00

6	Filter media						
	Behind Abutment	cum	2	9.900	0.600	3.520	41.82
	Behind Return Wall	cum	4	8.090	0.600	4.576	88.84
						Total	130.66

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					263.70
	Less for PCC	cum					29.88
	Less for Bottom Slab RCC	cum					33.36
	Less for Shear Key RCC	cum					6.56
	Less for Return Wall-I RCC	cum	4	1.400	0.300	0.500	0.84
	Less for Return Wall-II Base Slab	cum					51.78
	Less for Return Wall-II Stem Wall	cum	4	6.690	0.500	0.520	6.96
	Less for Box above Invert upto EGL	cum	1	3.96	11.500	0.500	22.77
						Total	111.54

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	3.960	10.500	0.390	16.21
	(+)Haunch	cum	2	10.50	0.01125		0.24
	(+)RCC Wall	cum	2	6.760	1.586	0.300	6.43
	(+)RCC Column	cum	4	0.600	0.900	0.686	1.48
						Total	24.36



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W =10.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					1.95
						Total	1.95

PROTECTION WORK

Upstream side

10	Earthwork for excavation						
		cum	1	4.400	2.00	0.50	4.40
						Total	4.40

11	PCC M 15 below Catch Pit						
		cum	1	3.400	1.50	0.30	1.53
						Total	1.53

12	Catch Pit Stone Masonry/PCC M15						
	Side wall length parallel to road	cum	1	3.400	0.360		1.22
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.30

13	300 mm Boulder Pitching						
		cum	1	2.800	1.50	0.30	1.26
		cum	1	3.666	1.50	0.30	1.65
						Total	2.91

14	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/34/3 (W =10.5 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
15	PCC M15 Downstream side						
	Below curtain wall	cum	1	8.727	0.95	0.150	1.24
	For PCC wall						
		cum	1	4.184	0.35	1.000	1.46
		cum	1	5.569	0.35	1.600	3.12
		cum	1	6.955	0.35	1.600	3.89
	Below PCC Wall						
		cum	1	4.384	0.55	0.100	0.24
		cum	1	5.769	0.55	0.100	0.32
		cum	1	7.155	0.55	0.100	0.39
	On trades						
		cum	1	3.491	0.85	0.100	0.30
		cum	1	4.876	0.85	0.100	0.41
		cum	1	6.262	0.85	0.100	0.53
		cum	1	7.734	1.00	0.100	0.77
						Total	12.69
16	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	9.327	1.55	1.95	28.19
	Stone Pitching and side wall	cum	1	6.014	3.320		19.96
						Total	48.16
17	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	8.427	1.003		8.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	10.44
18	300 mm Boulder Pitching						
	Below trades	cum	1	3.491	0.85	0.300	0.89
		cum	1	4.876	0.85	0.300	1.24
		cum	1	6.262	0.85	0.300	1.60
		cum	1	7.734	1.00	0.300	2.32
						Total	6.05



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/43/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	6.800	12.000	0.950	77.52
	Shear Key	cum	2	7.000	1.600	0.700	15.68
	Return Wall II	cum	4	6.310	5.150	0.700	90.99
						Total	184.19

2	PCC-M15						
	Box culvert	cum	1	5.800	9.000	0.150	7.83
	Shear Key	cum	2	6.000	1.390	0.150	2.50
	Return Wall II	cum	4	5.910	4.350	0.150	15.43
						Total	25.76

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	5.800	11.000	0.500	31.90
	Box Side Wall	cum	2	11.00	3.350	0.500	36.85
	Base slab of Return wall II	cum	4	5.810	4.150	0.400	38.58
	Return wall I	cum	4	0.400	3.800	0.250	1.52
	Return wall II	cum	4	5.810	0.325	3.900	29.46
	Shear Key	cum	2	5.800	0.45500		5.28
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	143.83

4	Steel						
	@ 80 Kg per cum of concrete	ton					11.51
						Total	11.51

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.5/2 =$					5	
	No of weep holes in vertical direction per abutment = $3.1/1 =$					4	
	No of weep holes in horizontal direction per return wall = $4.5/2 =$					4	
	No of weep holes in vertical direction per return wall = $3.1/1 =$					4	
	Total no of Weep holes per abutment = 5×4					20	
Total no of Weep holes per return wall = 4×4					16		
						Total	52.00

6	Filter media						
	Behind Abutment	cum	2	10.500	0.600	3.050	38.43
	Behind Return Wall	cum	4	6.210	0.600	3.500	52.16
						Total	90.59

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					184.19
	Less for PCC	cum					25.76
	Less for Bottom Slab RCC	cum					31.90
	Less for Shear Key RCC	cum					5.28
	Less for Return Wall-I RCC	cum	4	0.400	0.250	0.300	0.12
	Less for Return Wall-II Base Slab	cum					38.58
	Less for Return Wall-II Stem Wall	cum	4	5.810	0.450	0.400	4.18
Less for Box above Invert upto EGL	cum	1	5.00	12.000	0.300	18.00	
						Total	60.37

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	5.000	11.000	0.450	24.75
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	25.00



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/43/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					2.00
						Total	2.00
10	Bituminous Concrete						
		cum	1	5.00	10.00	0.04	2.00
						Total	2.00
11	Mastic Asphalt						
		sqm	1	5.00	10.00		50.00
						Total	50.00
12	Tack Coat						
		sqm	1	5.00	10.00		50.00
						Total	50.00
13	RCC M-40 Crash Barrier	m	2	5.00			10.00
						Total	10.00
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	5.400	2.00	0.30	3.24
						Total	3.24
16	PCC M 15 below Catch Pit						
		cum	1	4.400	1.50	0.30	1.98
						Total	1.98
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	4.400	0.360		1.58
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.66
18	300 mm Boulder Pitching						
		cum	1	3.800	1.50	0.30	1.71
		cum	1	4.666	1.50	0.30	2.10
						Total	3.81
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/43/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	9.727	0.95	0.150	1.39
	For PCC wall						
		cum	1	5.184	0.35	1.000	1.81
		cum	1	6.569	0.35	1.600	3.68
		cum	1	7.955	0.35	1.600	4.45
	Below PCC Wall						
		cum	1	5.384	0.55	0.100	0.30
		cum	1	6.769	0.55	0.100	0.37
		cum	1	8.155	0.55	0.100	0.45
	On trades						
		cum	1	4.491	0.85	0.100	0.38
		cum	1	5.876	0.85	0.100	0.50
		cum	1	7.262	0.85	0.100	0.62
		cum	1	8.734	1.00	0.100	0.87
						Total	14.82
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	10.327	1.55	1.95	31.21
	Stone Pitching and side wall	cum	1	7.014	3.320		23.28
						Total	54.50
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	9.427	1.003		9.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	11.45
23	300 mm Boulder Pitching						
	Below trades	cum	1	4.491	0.85	0.300	1.15
		cum	1	5.876	0.85	0.300	1.50
		cum	1	7.262	0.85	0.300	1.85
		cum	1	8.734	1.00	0.300	2.62
						Total	7.12
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	5.00	2.558		25.58
						Total	25.58



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	10.060	12.000	1.070	129.17
	Shear Key	cum	2	10.260	1.480	0.580	17.61
	Return Wall II	cum	4	6.860	6.300	0.950	164.23
						Total	311.01

2	PCC-M15						
	Box culvert	cum	1	9.060	9.240	0.150	12.56
	Shear Key	cum	2	9.260	1.220	0.150	3.39
	Return Wall II	cum	4	6.460	5.500	0.150	21.32
						Total	37.26

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	9.060	11.000	0.620	61.79
	Box Side Wall	cum	2	11.00	5.000	0.630	69.30
	Base slab of Return wall II	cum	4	6.360	5.300	0.650	87.64
	Return wall I	cum	4	1.900	5.520	0.300	12.59
	Return wall II	cum	4	6.360	0.450	5.490	62.85
	Shear Key	cum	2	9.060	0.34220		6.20
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	300.61

4	Steel						
	@ 80 Kg per cum of concrete	ton					24.05
						Total	24.05

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.4/2 =$						5
	No of weep holes in vertical direction per abutment = $4.7/1 =$						5
	No of weep holes in horizontal direction per return wall = $7.5/2 =$						5
	No of weep holes in vertical direction per return wall = $4.7/1 =$						5
	Total no of Weep holes per abutment = 5×5						25
Total no of Weep holes per return wall = 5×5						25	
						Total	75.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	4.700	58.66
	Behind Return Wall	cum	4	8.260	0.600	5.220	103.48
						Total	162.14

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					311.01
	Less for PCC	cum					37.26
	Less for Bottom Slab RCC	cum					61.79
	Less for Shear Key RCC	cum					6.20
	Less for Return Wall-I RCC	cum	4	1.900	0.300	0.300	0.68
	Less for Return Wall-II Base Slab	cum					87.64
	Less for Return Wall-II Stem Wall	cum	4	6.360	0.650	0.270	4.46
Less for Box above Invert upto EGL	cum	1	5.26	12.000	0.300	18.94	
						Total	94.03

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	5.260	11.000	0.583	33.70
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	33.95



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					2.72
						Total	2.72
10	Bituminous Concrete						
		cum	1	5.26	10.00	0.04	2.10
						Total	2.10
11	Mastic Asphalt						
		sqm	1	5.26	10.00		52.60
						Total	52.60
12	Tack Coat						
		sqm	1	5.26	10.00		52.60
						Total	52.60
13	RCC M-40 Crash Barrier	m	2	5.26			10.52
						Total	10.52
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	5.400	2.00	0.30	3.24
						Total	3.24
16	PCC M 15 below Catch Pit						
		cum	1	4.400	1.50	0.30	1.98
						Total	1.98
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	4.400	0.360		1.58
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.66
18	300 mm Boulder Pitching						
		cum	1	3.800	1.50	0.30	1.71
		cum	1	4.666	1.50	0.30	2.10
						Total	3.81
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	9.727	0.95	0.150	1.39
	For PCC wall						
		cum	1	5.184	0.35	1.000	1.81
		cum	1	6.569	0.35	1.600	3.68
		cum	1	7.955	0.35	1.600	4.45
	Below PCC Wall						
		cum	1	5.384	0.55	0.100	0.30
		cum	1	6.769	0.55	0.100	0.37
		cum	1	8.155	0.55	0.100	0.45
	On trades						
		cum	1	4.491	0.85	0.100	0.38
		cum	1	5.876	0.85	0.100	0.50
		cum	1	7.262	0.85	0.100	0.62
		cum	1	8.734	1.00	0.100	0.87
						Total	14.82
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	10.327	1.55	1.95	31.21
	Stone Pitching and side wall	cum	1	7.014	3.320		23.28
						Total	54.50
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	9.427	1.003		9.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	11.45
23	300 mm Boulder Pitching						
	Below trades	cum	1	4.491	0.85	0.300	1.15
		cum	1	5.876	0.85	0.300	1.50
		cum	1	7.262	0.85	0.300	1.85
		cum	1	8.734	1.00	0.300	2.62
						Total	7.12
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	5.26	2.558		26.91
						Total	26.91



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	10.060	12.000	1.070	129.17
	Shear Key	cum	2	10.260	1.480	0.580	17.61
	Return Wall II	cum	4	7.870	6.300	0.950	188.41
						Total	335.19

2	PCC-M15						
	Box culvert	cum	1	9.060	9.240	0.150	12.56
	Shear Key	cum	2	9.260	1.220	0.150	3.39
	Return Wall II	cum	4	7.470	5.500	0.150	24.65
						Total	40.60

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	9.060	11.000	0.620	61.79
	Box Side Wall	cum	2	11.00	5.335	0.630	73.94
	Base slab of Return wall II	cum	4	7.370	5.300	0.650	101.56
	Return wall I	cum	4	1.900	5.855	0.300	13.35
	Return wall II	cum	4	7.370	0.450	5.825	77.27
	Shear Key	cum	2	9.060	0.34220		6.20
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	334.36

4	Steel						
	@ 80 Kg per cum of concrete	ton					26.75
						Total	26.75

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.4/2 =$						5
	No of weep holes in vertical direction per abutment = $5/1 =$						6
	No of weep holes in horizontal direction per return wall = $7.5/2 =$						5
	No of weep holes in vertical direction per return wall = $5/1 =$						6
	Total no of Weep holes per abutment = 5×6						30
Total no of Weep holes per return wall = 5×6						30	
Total mtrs of weep holes = $30 \times 2 + 30 \times 4$						Total	90.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	5.035	62.84
	Behind Return Wall	cum	4	9.270	0.600	5.555	123.59
						Total	186.42

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					335.19
	Less for PCC	cum					40.60
	Less for Bottom Slab RCC	cum					61.79
	Less for Shear Key RCC	cum					6.20
	Less for Return Wall-I RCC	cum	4	1.900	0.300	0.300	0.68
	Less for Return Wall-II Base Slab	cum					101.56
	Less for Return Wall-II Stem Wall	cum	4	7.370	0.650	0.270	5.17
Less for Box above Invert upto EGL	cum	1	5.26	12.000	0.300	18.94	
						Total	100.25

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	5.260	11.000	0.520	30.09
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	30.33



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					2.43
						Total	2.43
10	Bituminous Concrete						
		cum	1	5.26	10.00	0.04	2.10
						Total	2.10
11	Mastic Asphalt						
		sqm	1	5.26	10.00		52.60
						Total	52.60
12	Tack Coat						
		sqm	1	5.26	10.00		52.60
						Total	52.60
13	RCC M-40 Crash Barrier	m	2	5.26			10.52
						Total	10.52
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	5.400	2.00	0.30	3.24
						Total	3.24
16	PCC M 15 below Catch Pit						
		cum	1	4.400	1.50	0.30	1.98
						Total	1.98
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	4.400	0.360		1.58
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.66
18	300 mm Boulder Pitching						
		cum	1	3.800	1.50	0.30	1.71
		cum	1	4.666	1.50	0.30	2.10
						Total	3.81
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	9.727	0.95	0.150	1.39
	For PCC wall						
		cum	1	5.184	0.35	1.000	1.81
		cum	1	6.569	0.35	1.600	3.68
		cum	1	7.955	0.35	1.600	4.45
	Below PCC Wall						
		cum	1	5.384	0.55	0.100	0.30
		cum	1	6.769	0.55	0.100	0.37
		cum	1	8.155	0.55	0.100	0.45
	On trades						
		cum	1	4.491	0.85	0.100	0.38
		cum	1	5.876	0.85	0.100	0.50
		cum	1	7.262	0.85	0.100	0.62
		cum	1	8.734	1.00	0.100	0.87
						Total	14.82
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	10.327	1.55	1.95	31.21
	Stone Pitching and side wall	cum	1	7.014	3.320		23.28
						Total	54.50
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	9.427	1.003		9.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	11.45
23	300 mm Boulder Pitching						
	Below trades	cum	1	4.491	0.85	0.300	1.15
		cum	1	5.876	0.85	0.300	1.50
		cum	1	7.262	0.85	0.300	1.85
		cum	1	8.734	1.00	0.300	2.62
						Total	7.12
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	5.26	2.558		26.91
						Total	26.91



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	10.060	12.000	1.070	129.17
	Shear Key	cum	2	10.260	1.480	0.580	17.61
	Return Wall II	cum	4	7.910	6.300	0.950	189.37
						Total	336.15

2	PCC-M15						
	Box culvert	cum	1	9.060	9.240	0.150	12.56
	Shear Key	cum	2	9.260	1.220	0.150	3.39
	Return Wall II	cum	4	7.510	5.500	0.150	24.78
						Total	40.73

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	9.060	11.000	0.620	61.79
	Box Side Wall	cum	2	11.00	5.350	0.630	74.15
	Base slab of Return wall II	cum	4	7.410	5.300	0.650	102.11
	Return wall I	cum	4	1.900	5.870	0.300	13.38
	Return wall II	cum	4	7.410	0.450	5.840	77.89
	Shear Key	cum	2	9.060	0.34220		6.20
	Haunch	cum	2	11.000	0.01125		0.25
						Total=	335.78

4	Steel						
	@ 80 Kg per cum of concrete	ton					26.86
						Total	26.86

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $10.4/2 =$						5
	No of weep holes in vertical direction per abutment = $5.1/1 =$						6
	No of weep holes in horizontal direction per return wall = $7.5/2 =$						5
	No of weep holes in vertical direction per return wall = $5.1/1 =$						6
	Total no of Weep holes per abutment = 5 x 6						
Total no of Weep holes per return wall = 5 x 6							30
Total mtrs of weep holes = 30 x 2 + 30 x 4						Total	90.00

6	Filter media						
	Behind Abutment	cum	2	10.400	0.600	5.050	63.02
	Behind Return Wall	cum	4	9.310	0.600	5.570	124.46
						Total	187.48

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					336.15
	Less for PCC	cum					40.73
	Less for Bottom Slab RCC	cum					61.79
	Less for Shear Key RCC	cum					6.20
	Less for Return Wall-I RCC	cum	4	1.900	0.300	0.300	0.68
	Less for Return Wall-II Base Slab	cum					102.11
	Less for Return Wall-II Stem Wall	cum	4	7.410	0.650	0.270	5.20
Less for Box above Invert upto EGL	cum	1	5.26	12.000	0.300	18.94	
						Total	100.50

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	5.260	11.000	0.520	30.09
	(+)Haunch	cum	2	11.00	0.01125		0.25
						Total	30.33



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					2.43
						Total	2.43
10	Bituminous Concrete						
		cum	1	5.26	10.00	0.04	2.10
						Total	2.10
11	Mastic Asphalt						
		sqm	1	5.26	10.00		52.60
						Total	52.60
12	Tack Coat						
		sqm	1	5.26	10.00		52.60
						Total	52.60
13	RCC M-40 Crash Barrier	m	2	5.26			10.52
						Total	10.52
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	5.400	2.00	0.30	3.24
						Total	3.24
16	PCC M 15 below Catch Pit						
		cum	1	4.400	1.50	0.30	1.98
						Total	1.98
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	4.400	0.360		1.58
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	2.66
18	300 mm Boulder Pitching						
		cum	1	3.800	1.50	0.30	1.71
		cum	1	4.666	1.50	0.30	2.10
						Total	3.81
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/45/0 (W =11 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	9.727	0.95	0.150	1.39
	For PCC wall						
		cum	1	5.184	0.35	1.000	1.81
		cum	1	6.569	0.35	1.600	3.68
		cum	1	7.955	0.35	1.600	4.45
	Below PCC Wall						
		cum	1	5.384	0.55	0.100	0.30
		cum	1	6.769	0.55	0.100	0.37
		cum	1	8.155	0.55	0.100	0.45
	On trades						
		cum	1	4.491	0.85	0.100	0.38
		cum	1	5.876	0.85	0.100	0.50
		cum	1	7.262	0.85	0.100	0.62
		cum	1	8.734	1.00	0.100	0.87
						Total	14.82
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	10.327	1.55	1.95	31.21
	Stone Pitching and side wall	cum	1	7.014	3.320		23.28
						Total	54.50
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	9.427	1.003		9.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	11.45
23	300 mm Boulder Pitching						
	Below trades	cum	1	4.491	0.85	0.300	1.15
		cum	1	5.876	0.85	0.300	1.50
		cum	1	7.262	0.85	0.300	1.85
		cum	1	8.734	1.00	0.300	2.62
						Total	7.12
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	5.26	2.558		26.91
						Total	26.91



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/53/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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FOUNDATION

1	Excavation						
	Box culvert	cum	1	7.740	13.000	1.020	102.63
	Shear Key	cum	2	7.940	1.530	0.630	15.31
	Return Wall II	cum	4	5.430	5.150	0.700	78.30
						Total	196.24

2	PCC-M15						
	Box culvert	cum	1	6.740	10.140	0.150	10.25
	Shear Key	cum	2	6.940	1.291	0.150	2.69
	Return Wall II	cum	4	5.030	4.350	0.150	13.13
						Total	26.07

SUBSTRUCTURE

3	RCC-Substructure						
	Bottom Slab	cum	1	6.740	12.000	0.570	46.10
	Box Side Wall	cum	2	12.00	3.000	0.570	41.04
	Base slab of Return wall II	cum	4	4.930	4.150	0.400	32.74
	Return wall I	cum	4	0.300	3.500	0.250	1.05
	Return wall II	cum	4	4.930	0.325	3.670	23.52
	Shear Key	cum	2	6.740	0.38745		5.22
	Haunch	cum	2	12.000	0.01125		0.27
						Total=	149.94

4	Steel						
	@ 80 Kg per cum of concrete	ton					12.00
						Total	12.00

5	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $11.5/2 =$						6
	No of weep holes in vertical direction per abutment = $2.7/1 =$						3
	No of weep holes in horizontal direction per return wall = $4.5/2 =$						3
	No of weep holes in vertical direction per return wall = $2.7/1 =$						3
	Total no of Weep holes per abutment = 6×3						18
Total no of Weep holes per return wall = 3×3						9	
						Total	36.00

6	Filter media						
	Behind Abutment	cum	2	11.500	0.600	2.700	37.26
	Behind Return Wall	cum	4	5.230	0.600	3.200	40.17
						Total	77.43

7	Sand Filling in Foundation Trenches						
	Total Cutting Volume	cum					196.24
	Less for PCC	cum					26.07
	Less for Bottom Slab RCC	cum					46.10
	Less for Shear Key RCC	cum					5.22
	Less for Return Wall-I RCC	cum	4	0.300	0.250	0.300	0.09
	Less for Return Wall-II Base Slab	cum					32.74
	Less for Return Wall-II Stem Wall	cum	4	4.930	0.450	0.470	4.17
Less for Box above Invert upto EGL	cum	1	6.14	13.000	0.300	23.95	
						Total	57.91

SUPERSTRUCTURE

8	RCC-Superstructure(up to 5m)						
	Top Slab	cum	1	6.140	12.000	0.569	41.91
	(+)Haunch	cum	2	12.00	0.01125		0.27
						Total	42.18



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/53/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
9	Steel						
	@ 80 Kg per cum of concrete	ton					3.37
						Total	3.37
10	Bituminous Concrete						
		cum	1	6.14	11.00	0.04	2.70
						Total	2.70
11	Mastic Asphalt						
		sqm	1	6.14	11.00		67.54
						Total	67.54
12	Tack Coat						
		sqm	1	6.14	11.00		67.54
						Total	67.54
13	RCC M-40 Crash Barrier	m	2	6.14			12.28
						Total	12.28
14	Drainage Spout	nos.	2				2.0

PROTECTION WORK

Upstream side

15	Earthwork for excavation						
		cum	1	6.400	2.00	0.30	3.84
						Total	3.84
16	PCC M 15 below Catch Pit						
		cum	1	5.400	1.50	0.30	2.43
						Total	2.43
17	Curtain Wall PCC M-20						
	Side wall length parallal to road	cum	1	5.400	0.360		1.94
	Side wall length perpendicular to road	cum	2	1.500	0.360		1.08
						Total	3.02
18	300 mm Boulder Pitching						
		cum	1	4.800	1.50	0.30	2.16
		cum	1	5.666	1.50	0.30	2.55
						Total	4.71
19	Guide wall-Stone Masonry/ PCC						
		cum	2	3.232	0.60	0.30	1.16
						Total	1.16



ESTIMATE OF QUANTITY OF BOX CULVERT

Box Size:- 01/53/0 (W =12 m)

Catch Pit and Stepped Protection

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
Downstream side							
20	PCC M15 Downstream side						
	Below curtain wall	cum	1	10.727	0.95	0.150	1.53
	For PCC wall						
		cum	1	6.184	0.35	1.000	2.16
		cum	1	7.569	0.35	1.600	4.24
		cum	1	8.955	0.35	1.600	5.01
	Below PCC Wall						
		cum	1	6.384	0.55	0.100	0.35
		cum	1	7.769	0.55	0.100	0.43
		cum	1	9.155	0.55	0.100	0.50
	On trades						
		cum	1	5.491	0.85	0.100	0.47
		cum	1	6.876	0.85	0.100	0.58
		cum	1	8.262	0.85	0.100	0.70
		cum	1	9.734	1.00	0.100	0.97
						Total	16.96
21	Earth work for excavation						
	Curtain Wall Down stream side	cum	1	11.327	1.55	1.95	34.24
	Stone Pitching and side wall	cum	1	8.014	3.320		26.60
						Total	60.84
22	Curtain Wall & Guide wall-Stone Masonry/PCC						
	Curtain Wall Down stream side	cum	1	10.427	1.003		10.45
	Guide Wall	cum	2	5.543	0.60	0.300	2.00
						Total	12.45
23	300 mm Boulder Pitching						
	Below trades	cum	1	5.491	0.85	0.300	1.40
		cum	1	6.876	0.85	0.300	1.75
		cum	1	8.262	0.85	0.300	2.11
		cum	1	9.734	1.00	0.300	2.92
						Total	8.18
Miscellaneous							
24	Painting						
	Crash Barrier	sqm	2	6.14	2.558		31.41
						Total	31.41



Summary sheet of Minor Bridges (Quantities)

		CHAINAGE	25.348	33.080	Total Quantity
		Span(m) x Height(m)=	1 x 10m RCC SLAB Brdige	1 x 8m RCC SLAB Bridge	
ITEM NO.	Description	Unit			
	A. Foundation				
Item no 1(a)	Excavation (upto 3 m depth)	cum	1194	1112	2306.048
Item no 1(b)	Excavation (3 m to 6 m depth in soil)	cum	267	0	266.581
Item no 2	R.C.C M30 (Foundation)	cum	167	167	334.080
Item no 3	P.C.C (M-15)	cum	52	52	103.554
Item no 4	Steel (Foundation)	ton	20	20	40.090
	B. SubStructure				
Item no 1(a)	R.C.C M30 (Substructure) upto 5m	cum	270	264	534.388
Item no 2	Steel (Substructure)	ton	38	37	74.814
Item no 3	Weep Holes	Rm	5198	5144	10342.000
Item no 4	Backfilling - Granular Material	cum	66	66	132.400
Item no 5	Backfilling - Sandy Material	cum	1553	1338	2890.930
Item no 6	Filter Media	cum	218	187	404.164
	C. Super Structure				
Item no 1(a)	R.C.C M30 (Superstructure)	cum	123	103	226.306
Item no 2	Steel (Superstructure)	ton	22	19	40.735
Item no 3(a)	Bituminous Concrete Wearing Coat(65mm)	cum	8	8	16.332
Item no 3(b)	Mastic Asphalt	sqm	204	204	408.320
Item no 3(c)	Tack Coat	sqm	204	204	408.320
Item no 3(d)	Cement Concrete Wearing Course	cum	1	1	2.784
Item no 4	RCC railing	metre	37	37	74.240
Item no 5	Crash Barrier	metre	37	37	74.240
Item no 6	Drainage Spout	each	4	4	8.000
Item no 7	PCC below approach slab	cum	11	11	21.504
Item no 18	R.C.C. Approach Slab with steel (M30)	cum	29	29	57.860
Item no 9	Filler Joint				
	(i) copper plate	metre	24	24	48.000
	(ii) fibar board	metre	24	24	48.000
	(iii) 20mm thick premoulded joint filler	metre	24	24	48.000
	(iv) joint sealing compound	metre	24	24	48.000
	D. Protection Work				
Item no 1a	Boulder Pitching	cum	3	57	59.266
Item no 1b	Filter Blanket	cum	1	28	29.633
Item no 2	Falling Apron on River Bed	cum	26	35	60.701
Item no 3	Toe Wall	cum	15	25	40.508
	E. Miscellaneous				
Item no 1	Painting	sqm	254	254	507.880
Item no 2	Citizen information board	no.	2	2	4.000



Summary sheet of Minor Bridges (Quantities)

		CHAINAGE	25.348	33.080	Total Quantity
		Span(m) x Height(m)=	1 x 10m RCC SLAB Bridge	1 x 8m RCC SLAB Bridge	
ITEM NO.	Description	Unit			
Item no 3	Confirmatory Boring in soil	m	6	6	12.000
Item no 4	Confirmatory Boring in Hard rock	m	10	10	20.000
Item no 5	Dismantle of Existing Bridge				
5.1	Foundation	cum	219	219	437.640
5.2	RCC	cum	393	368	760.690
	F. Diversion Work				
Item no 1	Earth cutting for Approach Road	cum	3600	3600	7200.000
Item no 2	GRANULAR MATERIAL	cum	3200	3200	6400.000
Item no 3	Hume Pipe	m	40	40	80.000
Item no 4	Pavement Composition				
4.1	BC	cum	30	30	60.000
4.2	DBM	cum	60	60	120.000
4.3	WBM	cum	300	300	600.000
4.4	GSB	cum	180	180	360.000



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 25.348 Km

1 span of 10 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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A. FOUNDATION

Excavation (up to 3m) in Soil							
Item no 1(a)	Foundation A1	cum	1	13.000	4.000	3.000	156.000
	Foundation A2	cum	1	13.000	4.000	3.000	156.000
	Return Wall II at A1	cum	2	25.500	3.400	2.544	441.130
	Return Wall II at A2	cum	2	25.500	3.400	2.544	441.130
Total							1194.260

Foundation Slab RCC-M30							
Item no 2	Abutment Foundation Slab	cum	2	12.000	1.100	0.600	15.840
		cum	2	12.000	1.100	0.600	15.840
		cum	2	12.000	0.800	0.800	15.360
	Return Wall II	cum	4	25.000	2.400	0.500	120.000
Total							167.040

Levelling Course M15							
Item no 3	Foundation Slab	cum	2	12.300	3.300	0.150	12.177
	Total							51.777

Steel Reinforcement (HYSD) for Foundation Slab							
Item no 4	@120 kg/cum	ton			20.045		20.045
	Total							20.045



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 25.348 Km

1 span of 10 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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B. SUBSTRUCTURE

Item no 1(a)	RCC-M30(up to 5m)						
	Abutment	cum	2	12.000	0.800	1.250	24.000
	Abutment Cap	cum	2	12.000	0.800	0.800	15.360
	Return wall II	cum	4	25.000	2.200		220.000
	Dirt wall	cum	2	12.000	0.400	0.988	9.485
	Bracket	cum	2	12.000	0.0612		1.469
Total=							270.314

Item no 1(b)	RCC-M30(5m to 10m)						
	Dirt wall	cum	2	12.000	0.400	0.988	9.485
Total=							

Item no 2	Steel reinforcement (HYSD Bars) for substructure						
	@ 140 kg/cum	ton			37.844		37.844
Total							37.844

Item no 3	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $11/2+1 =$						7
	No of weep holes in vertical direction per abutment = $1.3/1 +1 =$						1
	No of weep holes in vertical direction per return wall-I = $-0.3/1+1 =$						1
	No of weep holes in horizontal direction per return wall-I = $2.4/2+1 =$						3
	No of weep holes in vertical direction per return wall-II = $2.9/1+1 =$						3
	No of weep holes in horizontal direction per return wall-II = $25/2+1 =$						26
	Total no of Weep holes per abutment = 7×1						7
	Total no of Weep holes per return wall-I = 1×3						3
Total no of Weep holes per return wall-II = 3×26						78	
Total no of weep holes = $7 \times 2 + 3 \times 4 + 78 \times 4$							338

Item no 4	Backfilling(Granular Material)						
	Foundation	cum	2	16.000		0.400	12.800
	Return Wall-II	cum	4	26.700		0.500	53.400
Total							66.200

Item no 5	Backfilling(Sandy Material)						
	Behind Abutment & Return wall-I	cum	2	2.400	11.200	3.075	165.312
	Behind Return wall-II	cum	2	25.000	11.200	2.866	1604.960
	Deduct for filter media	cum					217.584
Total							1552.688

Item no 6	Filter media						
	Behind Abutment	cum	2	11.000	0.600	2.450	32.340
	Behind Return Wall-I	cum	4	1.800	0.600	3.075	13.284
	Behind Return Wall-II	cum	4	25.000	0.600	2.866	171.960
Total							217.584




ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 25.348 Km

1 span of 10 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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C. SUPERSTRUCTURE

Item no 1	RCC-M30(Up to 5M)						
	Superstructure Slab supported part	cum	1	10.760	12.000	0.919	118.661
	Superstructure Slab cantilever part	cum	1	10.760		0.250	
	Kerb	cum	2	18.560	0.500	0.225	4.176
Total							122.837

Item no 2	Superstructure Steel (HYSD Bars)						
	@ 180 kg/cum	Ton			22.111		22.111
Total							22.111

Item no 3(a)	Wearing Course (Bituminus Concrete)						
		cum	1	18.560	11.000	0.040	8.166
Total=							8.166

Item no 3(b)	Wearing Course (Mastic Asphalt)						
		sqm	1	18.560	11.000		204.160
Total=							204.160

Item no 3(c)	Tack Coat						
		sqm	1	18.560	11.000		204.160
Total=							204.160

Item no 3(d)	Cement wearing Course (75 mm thick on footpath)						
	PCC M30	cum	2	18.560	0.500	0.075	1.392
Total=							1.392

Item no 4	RCC Railing	m	2	18.560			37.120
	Total							37.120

Item no 5	Crash Barrier	m	2	18.560			37.120
	Total							37.120

Item no 6	Drainage Spout	nos.	4				4
	Total							4

Item no 7	PCC below Approach Slab						
		cum	2	11.200	3.200	0.150	10.752
Total							10.752

Item no 8	Approach Slab						
		cum	2	11.200	3.500	0.369	28.930
Total							28.930

Item no 9	Filler Joint						
	(i) copper plate	m	2	12.000			24.000
	(ii) fibar board	m	2	12.000			24.000
	(iii) 20mm thick premoulded joint filler	m	2	12.000			24.000
	(iv) joint sealing compound	m	2	12.000			24.000




ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 25.348 Km

1 span of 10 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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D. MISCELLANNEOUS

Item no 1	Painting						
	Kerb below railing.	sqm	2	0.950		18.56	35.26
	Railing(Post)	sqm	26	1.050		1.10	30.03
	Railing(Beam)	sqm	6	0.69		18.56	76.84
	Crash Barrier	sqm	2	2.204		18.56	81.81
	Flood Level Marking	sqm	1		30		30.00
Total							253.940

Item no 2	Confirmatory Boring						
	Confirmatory Boring in soil	m	2		3.00		6
	Confirmatory Boring in Hard rock	m	2		5.00		10
Total							16

Item no 3	Citizen information board	no.	2				2.00
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Item no 4	Dismantle of Existing Bridge						
	4.1	Foundation	cum	1			218.82
	4.2	RCC	cum	1			393.15

E.PROTECTION WORK

Item no 1a	Boulder Pitching						
	A1 side	cum	2	2.117		0.300	1.270
	A2 side	cum	2	2.402		0.300	1.441
	Total							2.711

Item no 1b	Filter Blanket						
	In slope pitching A1 side	cum	2	2.117		0.150	0.635
	In slope pitching A2 side	cum	2	2.402		0.150	0.721
	Total							1.356

Item no 2	Falling Apron						
	Infront of abutment	cum	2	12.000		1.052	25.248
	Parabollic part A1 side	cum	2	0.289		0.526	0.304
	Parabollic part A2 side	cum	2	0.327		0.526	0.344
Total							25.896

Item no 3	PCC(M15) Toe Wall						
	Infront of abutment	cum	2	12.000		0.601	14.424
	Parabollic part A1 side	cum	2	0.289		0.601	0.347
	Parabollic part A2 side	cum	2	0.327		0.601	0.393
Total							15.164




ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 25.348 Km

1 span of 10 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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F. Diversion Work

Item SI No.	Description	Unit	nos	Length	Breadth	Height	Quantity
Item no 1	Earth cutting for Approach Road						
		cum	1	150	3.00	8.00	3600.00
Item no 2	EARTH FILLING UNDER ROAD						
	GRANULAR MATERIAL	cum	1	100	8	4.00	3200
Item no 3	Hume Pipe	m	4		10		40.00
Item no 4	Pavement Composition						
4.1	BC	cum	1	150	8	0.025	30.000
4.2	DBM	cum	1	150	8	0.05	60.000
4.3	WBM	cum	1	150	8	0.25	300.000
4.4	GSB	cum	1	150	8	0.15	180.000



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 33.080 Km

1 span of 8 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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A. FOUNDATION

Excavation (up to 3m) in Soil							
Item no 1(a)	Foundation A1	cum	1	13.000	4.000	2.083	108.316
	Foundation A2	cum	1	13.000	4.000	2.331	121.212
	Return Wall II at A1	cum	2	25.500	3.400	2.544	441.130
	Return Wall II at A2	cum	2	25.500	3.400	2.544	441.130
Total							1111.788

Foundation Slab RCC-M30							
Item no 2	Abutment Foundation Slab	cum	2	12.000	1.100	0.600	15.840
		cum	2	12.000	1.100	0.600	15.840
		cum	2	12.000	0.800	0.800	15.360
	Return Wall II	cum	4	25.000	2.400	0.500	120.000
Total							167.040

Levelling Course M15							
Item no 3	Foundation Slab	cum	2	12.300	3.300	0.150	12.177
	Total							51.777

Steel Reinforcement (HYSD) for Foundation Slab							
Item no 4	@120 kg/cum	ton			20.045		20.045
	Total							20.045



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 33.080 Km

1 span of 8 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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B. SUBSTRUCTURE

Item no 1(a)	RCC-M30(up to 5m)						
	Abutment	cum	2	12.000	0.800	1.000	19.200
	Abutment Cap	cum	2	12.000	0.800	0.800	15.360
	Return wall II	cum	4	25.000	2.200		220.000
	Dirt wall	cum	2	12.000	0.400	0.838	8.045
	Bracket	cum	2	12.000	0.0612		1.469
Total=							264.074

Item no 1(b)	RCC-M30(5m to 10m)						
	Dirt wall	cum	2	12.000	0.400	0.838	8.045
Total=							

Item no 2	Steel reinforcement (HYSD Bars) for substructure						
	@ 140 kg/cum	ton			36.970		36.970
Total							36.970

Item no 3	Weep holes						
	Spacing for weep holes = 2 m in horizontal and 1 m in vertical direction						
	No of weep holes in horizontal direction per abutment = $11/2+1 =$						7
	No of weep holes in vertical direction per abutment = $1/1 +1 =$						2
	No of weep holes in vertical direction per return wall-I = $1.1/1+1 =$						2
	No of weep holes in horizontal direction per return wall-I = $2.4/2+1 =$						3
	No of weep holes in vertical direction per return wall-II = $2.5/1+1 =$						2
	No of weep holes in horizontal direction per return wall-II = $25/2+1 =$						26
	Total no of Weep holes per abutment = 7×2						14
	Total no of Weep holes per return wall-I = 2×3						6
	Total no of Weep holes per return wall-II = 2×26						52
Total no of weep holes = $14 \times 2 + 6 \times 4 + 52 \times 4$							260

Item no 4	Backfilling(Granular Material)						
	Foundation	cum	2	16.000		0.400	12.800
	Return Wall-II	cum	4	26.700		0.500	53.400
Total							66.200

Item no 5	Backfilling(Sandy Material)						
	Behind Abutment & Return wall-I	cum	2	2.400	11.200	2.676	143.862
	Behind Return wall-II	cum	2	25.000	11.200	2.466	1380.960
	Deduct for filter media	cum					186.580
Total							1338.242

Item no 6	Filter media						
	Behind Abutment	cum	2	11.000	0.600	2.050	27.060
	Behind Return Wall-I	cum	4	1.800	0.600	2.676	11.560
	Behind Return Wall-II	cum	4	25.000	0.600	2.466	147.960
Total							186.580




ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 33.080 Km

1 span of 8 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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C. SUPERSTRUCTURE

Item no 1	RCC-M30(Up to 5M)						
	Superstructure Slab supported part	cum	1	10.760	12.000	0.769	99.293
	Superstructure Slab cantilever part	cum	1	10.760		0.250	
	Kerb	cum	2	18.560	0.500	0.225	4.176
Total							103.469

Item no 2	Superstructure Steel (HYSD Bars)						
	@ 180 kg/cum	Ton			18.624		18.624
Total							18.624

Item no 3(a)	Wearing Course (Bituminus Concrete)						
		cum	1	18.560	11.000	0.040	8.166
Total=							8.166

Item no 3(b)	Wearing Course (Mastic Asphalt)						
		sqm	1	18.560	11.000		204.160
Total=							204.160

Item no 3(c)	Tack Coat						
		sqm	1	18.560	11.000		204.160
Total=							204.160

Item no 3(d)	Cement wearing Course (75 mm thick on footpath)						
	PCC M30	cum	2	18.560	0.500	0.075	1.392
Total=							1.392

Item no 4	RCC Railing	m	2	18.560			37.120
Total							37.120

Item no 5	Crash Barrier	m	2	18.560			37.120
Total							37.120

Item no 6	Drainage Spout	nos.	4				4
Total							4

Item no 7	PCC below Approach Slab						
		cum	2	11.200	3.200	0.150	10.752
Total							10.752

Item no 8	Approach Slab						
		cum	2	11.200	3.500	0.369	28.930
Total							28.930

Item no 9	Filler Joint						
	(i) copper plate	m	2	12.000			24.000
	(ii) fibar board	m	2	12.000			24.000
	(iii) 20mm thick premoulded joint filler	m	2	12.000			24.000
	(iv) joint sealing compound	m	2	12.000			24.000



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 33.080 Km

1 span of 8 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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D. MISCELLANEOUS

Item no 1	Painting						
	Kerb below railing.	sqm	2	0.950		18.56	35.26
	Railing(Post)	sqm	26	1.050		1.10	30.03
	Railing(Beam)	sqm	6	0.69		18.56	76.84
	Crash Barrier	sqm	2	2.204		18.56	81.81
	Flood Level Marking	sqm	1		30		30.00
Total							253.940

Item no 2	Confirmatory Boring						
	Confirmatory Boring in soil	m	2		3.00		6
	Confirmatory Boring in Hard rock	m	2		5.00		10
Total							16

Item no 3	Citizen information board	no.	2				2.00
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Item no 4	Dismantle of Existing Bridge						
4.1	Foundation	cum	1				218.82
4.2	RCC	cum	1				367.54

E.PROTECTION WORK

Item no 1a	Boulder Pitching						
	A1 side	cum	2	52.421		0.300	31.453
	A2 side	cum	2	41.837		0.300	25.102
Total							56.555

Item no 1b	Filter Blanket						
	In slope pitching A1 side	cum	2	52.421		0.150	15.726
	In slope pitching A2 side	cum	2	41.837		0.150	12.551
Total							28.277

Item no 2	Falling Apron						
	Infront of abutment	cum	2	12.000	1.052		25.248
	Parabolic part A1 side	cum	2	4.932	0.526		5.188
	Parabolic part A2 side	cum	2	4.153	0.526		4.369
Total							34.805

Item no 3	PCC(M15) Toe Wall						
	Infront of abutment	cum	2	12.000	0.601		14.424
	Parabolic part A1 side	cum	2	4.932	0.601		5.928
	Parabolic part A2 side	cum	2	4.153	0.601		4.992
Total							25.344



ESTIMATE OF QUANTITY OF SLAB BRIDGE

Chainage= 33.080 Km

1 span of 8 m Slab

Item No.	Description	Unit	nos	Length (m)	Breadth (m)	Height (m)	Quantity
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F. Diversion Work

Item SI No.	Description	Unit	nos	Length	Breadth	Height	Quantity
Item no 1	Earth cutting for Approach Road						
		cum	1	150	3.00	8.00	3600
Item no 2	EARTH FILLING UNDER ROAD GRANULAR MATERIAL						
		cum	1	100	8	4.00	3200
Item no 3	Hume Pipe	m	4		10		40.00
Item no 4	Pavement Composition						
4.1	BC	cum	1	150	8	0.025	30.000
4.2	DBM	cum	1	150	8	0.05	60.000
4.3	WBM	cum	1	150	8	0.25	300.000
4.4	GSB	cum	1	150	8	0.15	180.000

